For Users of Zenith Computers

SEXTANT®

Issue No. 29 July-August 1987 $3.50

eazy pc
(See pages 2 and 80)

Composition of Factors Overhead
Direct Labor
10%
This screen was captured and modified from CHART by MicroSoft Corporation.

New Zenith Monitor Offers Blacker Blacks

See page 80

Z100 Typesetting: Better than Desktop Publishing, *p. 22*

SigmaSoft's Hard Disk for Your '8 or '89, *p. 72*

The Z181: Portability Without Compromise, *p. 9*

The '148: All the Essentials for IBM Compatibility, *p. 48*

Photo by Gordon W. Nichols

32 There are two steps involved in making title slides on your computer. First, put big letters on the computer screen in a suitable combination of colors. Second, capture the screen image on film. Both steps can be educational adventures.

Photo courtesy of SigmaSoft and Systems

73 Several different sizes of Winchester disk can be added to the H8 or H/Z89 for use with either CP/M or HDOS. The economical prices include both power supply and disk controller.

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Features

The Z181: Portability Without Compromise
Don Carter 9

The Z181 has aroused a lot of interest. Its light weight and excellent screen display are an unmatched combination. The base price includes two disk drives, serial and parallel ports, plus support for a color monitor, 8087 math chip, and external mass storage. But what's it like after you've actually bought one and used it for a while?

Z100 Typesetting: Better than Desktop Publishing
John N. Serio 22

Most Z100 users are shielded from the temptation to spend thousands of dollars on a laser printer, plus hundreds of dollars more on software to support it. One journal editor with a Z100 found a less expensive way to control his own typesetting—and got better results, too. Of course, there is a slightly longer wait to see the output. But here's an alternative to desktop publishing that users of any computer with a modem can take advantage of.

Making Title Slides on Your '150 or '100
Gordon W. Nichols 32

The Eight-Bit World
Walter J. Janowski 38

Experiences with an internal hard disk for the '89 and a modification kit to clean up the scrolling of a '19 or '89. Plus comments on enhancements for CP/M and HDOS.

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July-August 1987

Not Another '100 Key Click Program (!)
R. John Davis 44

Some Z100 users consider the clicks produced by the keyboard a problem. Many of the suggested solutions involve software. For a change, here are three hardware modifications to silence the keys.

The '148: All the Essentials for IBM Compatibility
Wayne Rash, Jr. 48

The Z148 comes with a parallel printer port, a serial port, and support for both monochrome and color monitors. There are sockets for both 640K of RAM and an 8087 math chip. You can have two internal disk drives. But if you want to go beyond the basics, the '148 does have its limits.

Z100 Notebook
William N. Locke 54

Alternatives to rotating disks provide faster access to mass storage. A game recalls World War II air tactics. The Code Corner tackles assembly language to manipulate screen pixels.

Taming the Wild Interrupt
Robert S. Logan 64

Here's a program to let you calmly assess the internal state of your Z100 the next time it hysterically complains that an alien program has invoked a WILD INTERRUPT.

SigmaSoft's Hard Disk for Your '8 or '89
Kenneth A. Patrick 73

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Cover photo by Charles Floto (see page 2)

The Editorial Eye

During the month before sending this issue off to be printed, I attended two news conferences held by Zenith Data Systems. On May 12 in New York, they unveiled the ZCM-1490 Flat Technology Monitor. The cover of this issue shows one of the comparisons ZDS presented. The ZCM-1490 on the left conquered the threats of glare posed by my camera's flash and other room illumination. The IBM Personal System/2 Color Display 8513 on the right suffered from screen reflection—as would any monitor other than the ZCM-1490. (One reason not to use a flash when taking pictures of a video screen.)

The blacker blacks of the ZCM-1490 add significantly to its price. For example, the IBM monitor on the cover has a list price about $300 less than the ZCM-1490's suggested retail price of $999. (For more details, see page 80.)

The second news conference was on June 1 in Atlanta, where ZDS announced the eaZy pc computer described on page 80. They apparently were aiming to create a low-cost, MS-DOS analogue of Apple's Macintosh. Like the Mac, the eaZy pc features a black-on-white screen and uses 3½″ disk drives. Both are two-piece units linked by a keyboard cable. To these basic similarities, ZDS has added significant enhancements. The eaZy pc uses the same keyboard as the Z148. The basic unit is available with a 20-megabyte hard disk and one floppy drive ($1,699), two 3½″ drives ($1,199), or a single floppy drive ($999). Its screen is permanently attached to the base unit with a tilt-and-swivel mount. The eaZy pc has a 14″ screen; the Macintosh, an 8½″ screen.

The eaZy pc graphics are CGA compatible. But alphanumeric characters are formed with an 8 x 16 matrix of dots to provide a text display superior to that of Zenith's other CGA computers.

One of the Macintosh's selling points is that a buyer can learn to use it relatively quickly. ZDS has addressed this issue by shipping the eaZy pc with MS-DOS Manager, which it helped Microsoft design. Tutorial software is said to allow a new user to begin working with the system after half an hour. (Physical setup time is put at five minutes.)

Microsoft will be offering MS-DOS Manager to other computer makers. But Microsoft's Bill Gates suggested it will be a while before another vendor offers a product competitive with the eaZy pc. ZDS should have an even longer exclusive position in the flat-screen monitor market. They've ordered the entire 1987 production of the CRTs it's designed around. These are produced by Zenith Electronics Corporation, which has filed numerous patent applications to protect its monopoly on production of the new picture tubes.

During the past three years, ZDS has often been accused of abandoning the heritage of innovation represented by such products as the H89. It has sometimes seemed the company's engineers were too busy imitating IBM's microcomputers to contribute more than incremental improvements to the marketplace.

In 1986, ZDS stood out from the crowd when the Internal Revenue Service signed a contract to buy 15,000 to 18,000 portable Z171s. That success, Zenith's other government contracts, and the widely acclaimed Z181 portable left some observers viewing ZDS as limited to a few narrow markets.

But the ZCM-1490 offers advantages any user of color monitors can appreciate. And the eaZy pc manages to be "user-friendly" without being user-patronizing. Both products offer innovations all Zenith users can be proud to have in the family. After attending the two recent ZDS news conferences, I can understand why there's so much excitement at the company.

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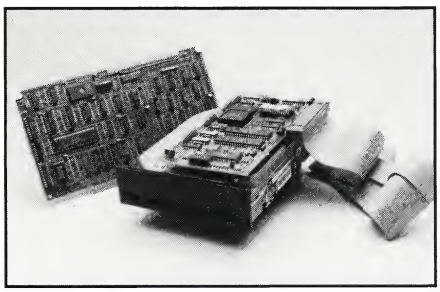

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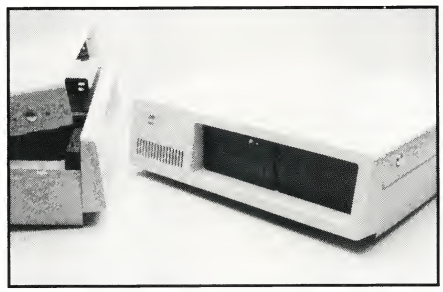

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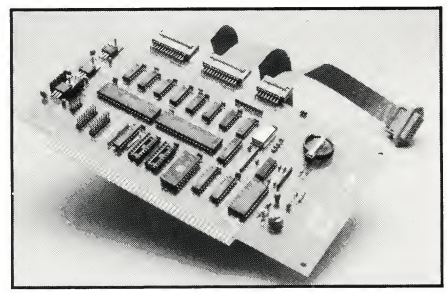

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Letters

Memory problems

This letter is in response to the article by John J. Batbie, Jr., about the MDISK software for the Z100, that was in the May-June issue. In it, he talks about the problem of this program not working when set for greater than 511K.

I debugged and found the correction for the problem myself quite some time ago, and shortly after that I saw it written up in one of the magazines. I think it was a letter in either *REMark* or *Sextant*; I don't remember which—or which issue.

In any case, the correction is simple. Load the MDISK.ASM file into your editor and find the line that defines MD_SIZE_END. (Line 491, if your editor can reference line numbers; otherwise, just use a string search.) It is an equate between two data tables—MD_SIZE, consisting of four DW statements, and MD_DIRS, consisting of five DW statements.

Change this line from:

```
MD_SIZE_END = OFFSET $
```

to:

```
MD_SIZE_END = OFFSET $ - MD_SIZE
```

Re-assemble it and it will now work properly for all sizes.

Larry Hudson
Ventura, CA

See the following letter for the reference to the issue of REMark *that contains the bug fix.*

. . .and the fix

"Assemble a New Memory Disk for your '100" by John J. Batbie, Jr., was most interesting, but the author failed to note that there is a "bug" in this utility that was reported in *REMark*, April 1986, page 8, by Ross A. Ziegenhorn of San Antonio, Texas.

I can affirm that the bug is there (the memory disk vaporizes on occasion), and so far the "fix" works.

That clock face ["Put A Clock Face On Your '100," by Angelo Giambra, *Sextant* #28, May-June 1987] is gorgeous—I use it to bamboozle all visitors.

Robert W. Rasch
Johnson City, TN

Speedy solutions

I have read with interest the letters by James Pilarski and W. K. Clarkson in the May-June 1987 issue of *Sextant*.

I have installed the Micronics Technology Speed Mod in my H89, and encountered the same problems described in W. K. Clarkson's article ["Four Upgrades for the '89," in *Sextant* #26, January-February 1987].

With help from Darrell Pelan of Micronics, I was able to get the Speed Mod working for my peculiar system configuration. The increase in speed for spreadsheets, compiles, etc., has been amazing.

For anyone interested, I am making the following programs available for the cost of a long self-addressed, stamped envelope: modifications to Micronics' program to adapt the Speed Mod for the HUG HDOS SY: driver; an HDOS program to implement the Speed Mod for the C.D.R. Super RAM; and an HDOS program to toggle the CPU speed, similar to the one W. K. Clarkson described in his article.

I personally do not believe in charging for these types of programs. By making them available to other H89 users, I hope to help the few remaining 8-bit vendors to continue with their efforts to provide enhancements for the 8-bit machines.

Both the Speed Mod and the C.D.R. Super RAM are excellent products which I would highly recommend. The support I have received from Micronics has been great. I can't say the same for C.D.R. Repeated questions about some minor problems with the HDOS implementation have gone unanswered.

Adolph P. Stumpf
507 E. Palm St.
Litchfield Park, AZ 85340

SUBMITing insurance

While perusing your usual excellent and varied fare in *Sextant* #28, May-June 1987, I noted two items which require some feedback. One was the problem which James Pilarski discussed, in your "Letters" section, when using CP/M's SUBMIT under C.D.R.'s RAM drive. The second is a topic which Doris Wagner and Alan Heigl could have covered in their first installment on the care and feeding of binary equipment ["Computer Self-Defense: The First Steps," also in issue #28], but did not: insurance. I'll turn first to Pilarski's difficulty.

There are significant variations in how the various CP/M-80 BIOSs handle SUBMIT files. I have a problem similar to the one Pilarski describes when running the RAM drive under Magnolia Microsystem's version 2.24. SUBMIT's scratch file is written to the bootable disk and is immediately lost track of when the RAM drive is initialized as drive A:. On the other hand, standard Zenith version 2.2.03 does *not* exhibit this. On the presumption that Pilarski *must* use C.D.R's version 2.91-M BIOS, perhaps the simplest workaround is the one I devised for Magnolia's version.

First, set the cold-boot command line option to run *only* ARAM to initialize the RAM drive. Second, call the *remainder* of the SUBMIT file from drive B: (or wherever) with: B:SUBMIT B:RAMDRIVE. While this is a *two*-step procedure, it also has an advantage if RAMDRIVE.SUB is long. If you have a quick project, you don't have to wait for the entire SUBMIT file to execute. Instead, after cold booting, you can change the default drive to B: and work entirely from floppy.

Turning now to Wagner and Heigl's omission, the subject of insurance is certainly something which everyone who purchases a microcomputer should consider. Many standard home and business policies do *not* cover software replacement! Check with your insurance agent to see if a rider can be added to your existing policy which will include at least this specific area. If none is available, there are a few agents who handle microcomputer policies. I've been satisfied with:

Data Security Insurance
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Whoever you use, you should be particularly interested in hardware and software replacement. And, if you are a business, you should also consider provision for data-entry backup while a damaged or destroyed system is being repaired or replaced.

However, whether you need data-recovery coverage—another option—is something you will need to decide. I deemed not; instead, I store my valuable data disks in a fire-proof safe. That, though, may be a bit over the falls! But it was a one-time expense and, in my rivery judgment, gives the disk library for my Neanderthal '89 adequate protection.

As your system grows (inevitably, as Wagner and Heigl mentioned, and I know), its value could very well approximate that of your car. Would you drive without insurance? Then don't compute without it!

Kirk L. Thompson
West Branch, IA

Micronics responds

A few corrections are required to Mr. Clarkson's review of the H89 Speed Mod in issue #26 of *Sextant* ["Four Upgrades for the '89"]. I would also like to comment on his response to Mr. Pilarski's letter in issue #28.

First, the Speed Mod review. Mr. Clarkson's review was published nearly a year after he purchased Speed Mod, and did not evaluate the update software sent to him. Mr. Clarkson also derided SPEED's inability to switch the H89 to 2 MHz (even though it reported doing so). The documentation stated that the origi-

nal HDOS code operated at 4 MHz only. Source code for SPEED and for my first attempt at a software-selectable SY: driver were included on the disk to allow Speed Mod users to support non-Heath versions of CP/M and HDOS. In fact, several users have developed additional support for Speed Mod. Their code, with proper credit, is included on the current distribution disk.

The software (released March '86) that Mr. Clarkson did not look at was the first HDOS version that supported both 2- and 4-MHz operation. The current version was released in March '87 and was announced in issue #135 of *Buss*. Both Micronics' CP/M and HDOS versions automatically switch to 4 MHz during the boot process, eliminating the need to manually switch to 4 MHz. The current version of SPEED, for HDOS and CP/M, toggles, reports, or explicitly sets the operating speed to 2 or 4 MHz. Source code is included. Upgrades are available on CP/M or HDOS disks for $5 each, or free from our BBS (904/897-4966, 24 hours, 300/1200 baud). The file SM89.LBR, located on drive B1:, contains the software for CP/M and HDOS.

In Mr. Clarkson's reply to Mr. Pilarski, I must strongly disagree with Mr. Clarkson's statement that "most public domain programs are worth exactly what you pay for them." My BBS has several megabytes of public domain software that performs better than commercial software. The MDMxxx series, NSWEEP, and ZCPR are only a few of the examples that come immediately to mind. As to the software that Mr. Clarkson is selling, our improved version of SPEED with source is available free on the BBS for both CP/M and HDOS. CITOH.COM, with Turbo Pascal source, is also available. CITOH sets the margins, characters per inch, and other special features for the Prowriter printer. It can be easily adapted to Epson printers. The Software Toolworks C compiler comes with a program, TAB.C, that replaces spaces with tabs. The reverse process is simple to derive from this example.

Micronics Technology remains committed to the H89. Our newest product, the WIN89, a 20-meg Winchester, demonstrates our continuing effort.

Darrell C. Pelan, President
Micronics Technology
449 Barbados Way
Niceville, FL 32578

Mr. Clarkson's article was a description of his experiences with upgrading his '89, and not a review of any one product. He had no need to use the March 1986 Speed Mod software update, since by that time he had already developed his own software.

For a look at the WIN89, see Walt Janowski's column, "The Eight-Bit World," on page 38 of this issue.

The clock *does* strike midnight

Mr. Giambra's "Put A Clock Face On Your '100" [*Sextant* #28, May-June 1987] is nice 'cept the clock doesn't strike at midnight and, being a night owl, I'd miss that.

The internal clock never gets to 2400 hours; therefore, the chime statement in line 300 will not produce twelve beeps for midnight because it's actually 00:00 hours. I solved it by adding a line:

```
305 IF MID$(TIME$,4,2)="00" AND
  MID$(TIME$,1,2)="00" THEN CHIME=12
```

Otherwise, a nice little program. (And it gives your house or office one of the most expensive alarm clocks in the neighborhood!)

Thanks, Mr. Giambra and *Sextant*. Keep up the ideas.

Rodney E. Cavin
Altamonte Springs, FL

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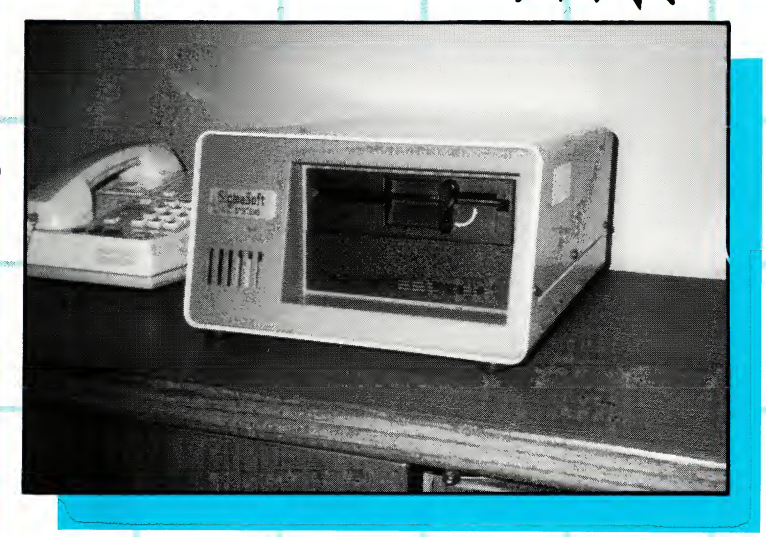

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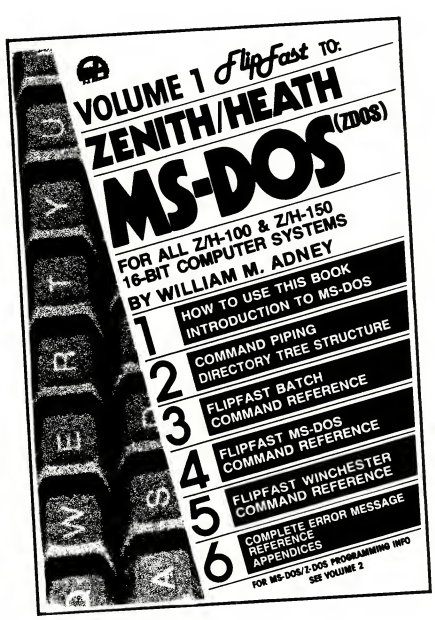
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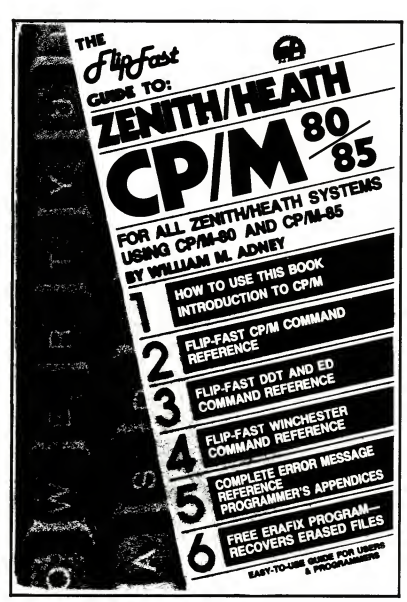
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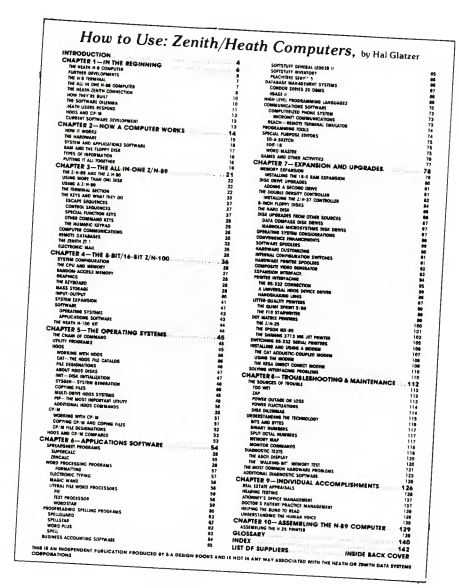

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By Hal Glatzer

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The Z181: Portability Without Compromise

It weighs 12 pounds. That includes dual drives, 640K RAM, serial and parallel ports, a clock/calendar, and support for a color monitor and external mass storage. But what really sets it ahead of the competition is the way it passes the screen test.

Don Carter

"Delightful" is a word that is heard more often in the lobby of a theater than in the aisles of a computer show, but it does describe the Zenith Z181 laptop computer. A unique set of features establishes its superiority over many competitors.

The Z181 is manufactured in Japan in accordance with Zenith specifications, and is the latest in the line of Heath/Zenith computers compatible with the IBM Personal Computer. The basic Z181 comes complete with two 3½″ drives, each capable of storing 720 kilobytes, double that of standard 5¼″ disks. It all fits in a sleek, slim package the size of an ordinary loose-leaf notebook. It costs $2,399 and weighs less than 12 pounds.

(A newer version, the Z183, is now available; it's faster and includes an internal 10-megabyte hard disk. So, if you want, you can get a PC XT in miniature. See "Late News on the '181—and the '183," accompanying this article.)

The Z181 also comes standard with a full 640K of random-access memory (RAM), and a self-contained battery with a five-hour capacity when the disk drives are used sparingly. It runs the Microsoft Disk Operating System (MS-DOS).

Most notably, the Z181 sports a 10″ liquid-crystal display (LCD) screen that has astonishing brilliance. Once again, Heath/Zenith has taken a step forward in furthering the design of microcomputers.

The Z181 was the only real hit of the June 1986 National Computer Conference in Las Vegas, as well as of the PC Faire in San Francisco. There are many reasons why all the reviewers and critics have been so glowing in their reports of the Z181. One is that this laptop is only 13.4″ x 11.6″ x 2.9″. This miniaturization has been achieved by excellent design and the use of new and radical surface-mount technology. (See "A Little Background," accompanying this article.)

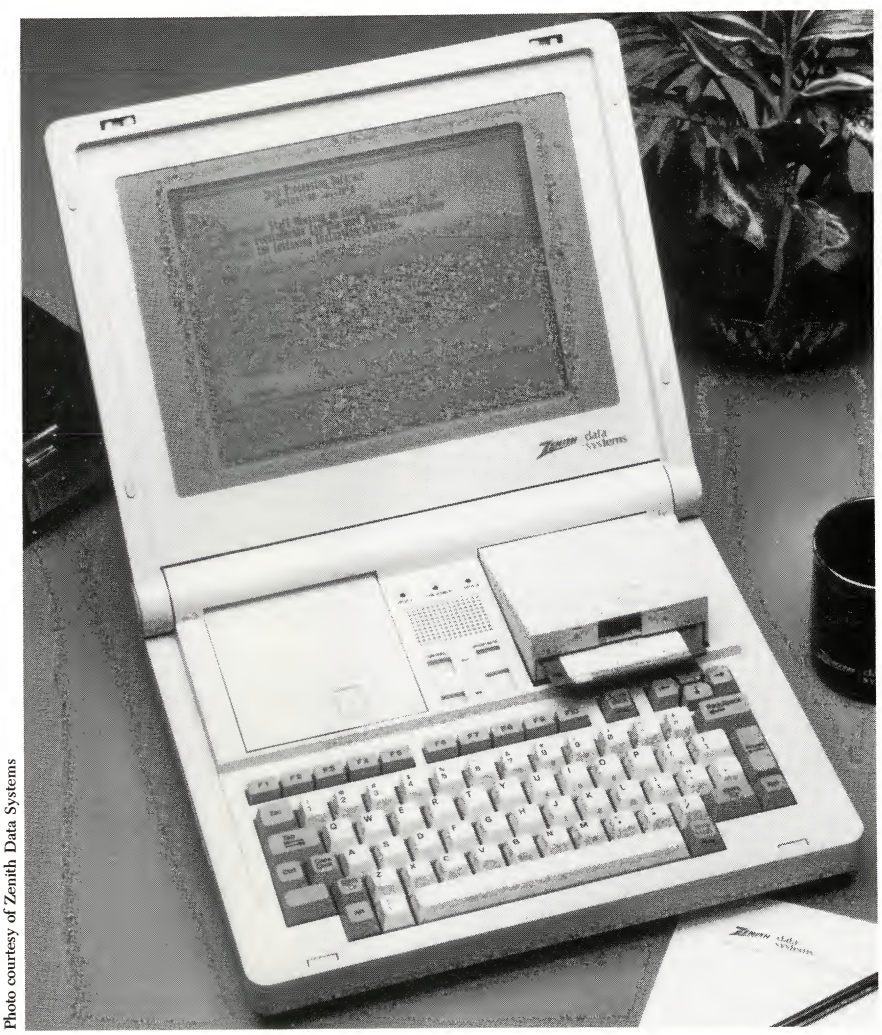

Photo courtesy of Zenith Data Systems

What a luxury it is to carry out research now. I can do my reading in a reference library with the Z181 right at hand, and not have to rewrite all my notes later.

There are a number of other conveniences offered by the Z181. Professionals or technicians who must keep their desks or workbenches clear can place the Z181 in a drawer that has one side panel cut away so that the computer

Don Carter is twice retired, having spent 25 years in the Royal Canadian Air Force, and 25 more doing yacht work in Florida. He now keeps busy exploring the '181.

A Little Background

Miniaturization has been a continuing trend in computer design. In 1976, Iasis, Inc., of Sunnyvale, California, introduced the ia7301 "Computer in a Book." An 8080A-based computer with 1K each of RAM and ROM, a 24-key keypad, and an eight-character hexadecimal readout were mounted in a three-ring binder. The system was quite portable, even with the power supply and cassette recorder.

As far as public awareness is concerned, the big step was made when Radio Shack and NEC introduced "knee-top" portable computers. The hopes of Apple fans for a portable rose a few years ago when Apple announced their IIc with a floppy-disk drive, separate 12-v DC power supply, and LCD readout. Those hopes promptly fell when the LCD option was withdrawn.

A major advance was obtained with the advent of "surface-mount" technology. Surface-mount technology differs from conventional printed-circuit (PC) boards in a number of respects.

With conventional boards, for instance, there are circuit traces on both sides. Soldering pads are frequently plated through, and component leads (pigtails) can go all the way through the board. With surface-mount technology, boards are plated on only one side; components are cemented to the board. This improves heat dissipation and simplifies assembly.

For surface-mount boards, the chips used are rectangular, with small connectors on all four sides. The connectors are joined to the circuit traces by special soldering instruments or silver-loaded epoxy.

The components themselves are quite small; for instance, an eighth-watt resistor is only 3.2 x 1.6 x 0.6 millimeters. Overall, the result is that surface-mount boards can be one-third the size of a normal PC board, and much thinner.

As technology developed, almost every laptop (and there have been many) was the subject of much scrutiny in computer shows and stores. But they all lacked certain important features, the most notable being an easily readable LCD.

I found this puzzling, since a few low-priced calculators had displays that produced excellent contrast based just on reflected light. Their displays were remarkably distinct, and superior to those of many laptops.

Finally, the "super-twist" technology (now used in the Z171, Z181, and Z183) became available to computer manufacturers. Then it became a question of who would use it best. Predictably, Heath/Zenith beat the competition to the ultimate in design.

(The details of Heath/Zenith's entry into the laptop field with the ZP-150, the Z171, and Z181 was neatly summarized by Wayne Rash in *Sextant* #26, January-February 1987. See "Zenith: Planning for the Future.")

can be immediately usable. On a business trip, this small tidy package will be a lot more convenient than the large bulky item you'd have to carry if you wanted to bring a conventional computer with you. At home, if you have young visitors whose activities must be monitored, the '181 can be stored in an absurdly small space; when you wish, it can be readily moved to a central location so that its pleasures can be shared.

However, the prime reason for the excitement over the Z181 is that it is the first full-function laptop to give us a flat screen with so many of the features of a conventional cathode-ray tube (CRT). The aspect ratio is the same as on a CRT; your pie charts will be circular, not slightly egg-shaped.

Most important, however, is that *this* LCD screen gives you a display that can be easily read in any light, even by kibitzers looking over your shoulder. You no longer need worry that using an LCD screen means having to get the angle and the lighting absolutely perfect for the screen to be just barely readable.

Surprise!

But I'm getting ahead of myself.

The Z181 was first announced in the summer of 1986, and units became available in September. By early October, I had collected sufficient details to decide that this laptop had all the features I had been seeking for several years. I called Heath Company to put in my order.

My hopes faltered when I found that the sales department didn't yet have the Z181 on any of its lists. The machine was expected to become available in mid-December. I became more cheerful, however, after they referred me to a higher echelon. The sales coordinator took my order, promising to try for an earlier date.

However, I was about to have a real

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surprise. Six days after I placed my order, the truck from United Parcel Service drove up and delivered two packages. It took no time at all for setup and testing (after a thank-you call to Heath).

I had heard that some laptops were having serious compatibility problems with some programs written for the desktop MS-DOS computers. Not so the Z181. Except for Tandy's IBM-compatible games, every piece of software was readily transferred and ran without a hitch. (More on compatibility later.)

The LCD screen

The greatest single advance the Z181 presents is in screen design. In the past, LCDs were difficult to read unless both the light and the angle of viewing were precisely suitable. (Backlighting an LCD screen improved its display quality, but could not completely overcome its limitations.)

The development of super-twist displays marks a great advance in engineering.

Conventional LCDs are referred to as "twisted nematic" devices. The new LCD screen is the product of what is called "super-twist" technology. Here, an electroluminescent layer provides a backlight. In front of this is a "super-twisted birefringent-effect" (SBE) LCD screen; as with conventional LCDs, the crystals are re-oriented to block out light, thereby forming the individual dark letters against a light background.

The "super-twist" LCD is characterized by its unique cigar-shaped crystals; these can be oriented so closely together that virtually all light is blocked off. The result is a high-resolution display with a contrast ratio of 12 to 1 (which is comparable to the 15 to 1 of the average CRT). Conventional LCDs provide a contrast ratio of only 3 to 1.

The Z181's presentation is rock steady without a trace of flicker. To conserve power, the backlight automatically turns off if there has been no keyboard action for two minutes—it turns back on as soon as a key is depressed.

Unlike virtually all laptops, the aspect ratio of the Z181 screen is, as mentioned above, identical to that of a full-size CRT. Circles and squares are shown in their true form instead of as ovals and rectangles. A full 25 lines of 80 super-sharp characters are presented on the screen.

Located between the disk drives, two sliders (contrast and brightness) can be adjusted to provide an optimum presentation to suit any room-light condition. When the brightness is turned all the way to MIN, the screen is darkened, but text can still be made readable by a tilt to the best angle.

When these two controls are adjusted to an ideal setting, however, the effect is quite magical. You get deep midnight-blue characters on a silvery background. It's rather like night and day, the extremes of color in a tropical sky. (But take care: there's a soft hum that might prove to be too relaxing.)

The development of LCDs has been progressing slowly for many years, ever since digital watches and meters were introduced. Larger LCDs were ideal for the alphanumeric output of marine Fathometers and lorans, and incandescent backlighting became necessary for greater readability.

But this new development—super-twist displays—marks a great advance in engineering. There are now more than ten layers in the LCD panel, including polarizing elements, glass, barriers, and crystal electrodes. The life expectancy of the super-twist LCDs is considered to be excellent. (However, sunlight shortens the life of some types of loran displays. And technicians know that if a digital meter is carried around in a car, the LCD screen blackens in a few years. This will probably happen whenever the LCD is exposed to heat for long periods of time.)

Incidentally, I have found that many hours of work with this LCD screen does not induce even a trace of eyestrain. My only problem is finding the cursor when it is buried in text—perhaps more vertical separation and a slower pulse might increase the contrast. (The Technical Reference Manual gives the codes for changing the size of the cursor, but I have not yet tried it.)

The keyboard

If you are used to the keyboards on Heath/Zenith desktop computers, you may notice that the Z181's keys are faster and have a somewhat lighter touch. The keyboard uses a technique known in the electronic typewriter trade as "breakover." This provides full tactile response by changing the back resistance fairly rapidly at the end of the keystroke, but completing the circuit near the half-way point.

Full travel is about 3/16", and the click at the end of each stroke can be almost completely subdued by using the lightest possible touch. Typists used to a typewriter find the keyboard more responsive, and newcomers discover how easy it is to learn touch typing.

This full-sized keyboard has been fitted into a compact package by reducing the number of keys to 75 from the 84 usually found on Heath/Zenith's IBM compatibles. (An addition is the Fn key, located in

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the lower left corner of the keyboard.) Functions usually performed by the numeric keypad have been allotted to keys surrounding the "I". The keys are marked with orange identifiers, and this feature is locked in by means of Fn-NumLock.

Four cursor-control keys in the form of a cross are conveniently located at the upper right, and have dual functions (marked with blue lettering); when used with the Fn key, they provide page up, page down, home, and end. Another valuable function, Fn-PrtScr, will send everything on the screen to the printer.

Although the dual functions appear somewhat complex, they become quite natural after a few sessions. In the manual, a table of 28 key sequences provides a cross-reference between the Z181 and an IBM PC. Except for keys such as Alt, Break, etc., all keys are self-repeating when held down for more than a second.

I miss the old-fashioned mechanical CAPS LOCK feature; on this keyboard, there is no visual signal to remind me I'm in caps mode, and I occasionally find myself typing part of a line in uppercase. This would be a point where a light-emitting diode (LED) would come in handy. Moreover, it has been incorporated in other battery-powered machines. On Canon typewriters, for instance, there is a bright red LED in one corner of the LOCK key, which is quite logical. Whether your eyes glance toward the text or toward the keyboard, you are aware of the status.

Hooking up a color monitor

You will see an unusual presentation on the LCD screen if you call up the 16-color test display from the resident monitor routines. (See "Multi-Function Monitor," below.) The result is not really shades of gray, but six or seven tints of brown, purple, and indigo—probably the result of the backlight and the alignment of crystals. It's rather spooky to see a semblance of color on a monochrome screen.

But while the LCD screen is monochrome, the Z181 will give you color if you have it hooked up to a standard color monitor. Fn-F10 will kill the LCD display and activate the monitor. And if you are going to make heavy use of a Z181 in a location with AC power, it might be worthwhile to consider a separate monitor—at least until more is known about the expected life and replacement cost of the LCD screen.

A faster chip is present in an upgraded version of the Z181.

The Z181 screen is not removable, so the monitor must be placed to one side during use. Alternatively, the screen can be tilted back all the way; this will leave its edge about nine inches above the desk top. The computer can then be bridged by a stand holding the monitor. (This makes a satisfactory arrangement except for those who must wear bifocals—reading glasses are in order.)

The Z181's video-controller board is based on the V6355 chip and emulates IBM's Color Graphics Adapter (CGA) board, the standard until the Enhanced Graphics Adapter (EGA) board was introduced last year. With a color monitor, CGA-compatible programs will allow you to choose between two palettes of four colors each out of a possible 16. The display is 320 x 200 pixels. (EGA compatibility has already been adopted by Kaypro in their newly announced 3000 laptop, and I would hope that Zenith is considering it as a possibility for future versions of the Z181.)

Heath's ZVM-1330 color monitor is a good match for the Z181; this monitor is an RGBi type, which recognizes two intensity levels as well as the standard red, green, and blue signals. This allows it to recognize 16 colors; IBM-compatible software will allow you to select among palettes of four colors at a time.

But the Z181 is not inherently limited to CGA operation. The V6355 board can produce a total of 512 colors and form 16-color palettes. (The V6355 chip is also capable of producing a 640-x-240-pixel screen, but the Z181 would need additional support logic and video memory for this.)

Additionally, the V6355 gives you the capability of defining a sprite, a pattern of pixels that can be moved around as an independent unit. This hardware feature will require software that has the capability of accessing it.

Even though the Z181's color display is limited to the normal 320 x 200 pixels, its new color capabilities offer exciting potentials that software developers might do well to exploit.

(You might want to consider this possibility when selecting a video monitor. A step above the ZVM-1330 is the ZVM-1380, an RGBrgb type; it accepts a separate intensity signal for each of the three primary colors, and produces a possible 64 colors.)

Chips and options

The Z181's central processor is a 4.77-megahertz 80C88; this 16-bit chip is functionally equivalent to the 8088 in the Z150 and other compatibles, but uses complementary metal-oxide semiconductor (CMOS) technology for lower power requirements.

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Today's headlong quest for speed may rate 4.77 MHz as a bit slow. One critic who made this complaint was amused when I pointed out a Zenith option that could be used to offset the "slow" speed. I suggested that the power cable to the cigarette lighter encourages the use of the Z181 while commuting. Any seconds lost at home or work can be recovered at traffic stops.

However, public demand is important; as mentioned in "Late News on the '181—and the '183," accompanying this article, a faster chip is present in an upgraded version of the Z181. And Intel's CMOS version of the 80286 processor is in production, so we can assume that an AT-compatible version of a laptop is feasible. In the meantime, by plugging in the optional 8087 numeric co-processor, you will be able to rival the performance of mainframe computers when running engineering computations and some types of graphics software.

Heath offers an 8087 co-processor (the Z316-8) for $285—it's a real aid for anyone doing a lot of number crunching. In brief, the 8087 accepts four-function arithmetic data, and processes it a hundred times faster than the 80C88. Square roots and trigonometric functions also gain high speed.

But beware of bargains. Although Intel has a monopoly on the 8087, it comes in different speeds. Some are not as reliable as others, and some may not operate in all machines. Money-back guarantees are seldom offered.

(For more on the benefits and use of the 8087, see "Speeding Up Your '100 or '150 With the 8087 Math Chip" by Alan T. Moffet, in *Sextant* #21, March-April 1986.)

Benefits of 3½" disks include doubled storage capacity and easy handling.

The size of the RAM is satisfactory for running all the large popular business programs. The only internal plug-in options are a 300/1200-baud Hayes-compatible modem and an 8087 co-processor.

Along the back of the computer (covered by a hinged door) are the sockets for a parallel printer, external floppy-disk drives (designated EXT FDD), and an RGB/video monitor. Here, too, is the RS232C serial port, which will accept an external modem, a bar-code reader, or a mouse.

The serial port also supports PCXFER. This program comes with the Z181 on both 3½" and 5¼" disks; it can be used to transfer ordinary ASCII text between the Z181 and an IBM compatible through a null-modem cable.

Alas, the Z181 is like most IBM compatibles in that it does not come with a socket for any analog interface. So, the most enticing, entertaining, and exciting graphics program for adults, Microsoft's Flight Simulator, will result in frequent crash landings—four cursor-control keys make a poor substitute for a joystick.

Disk drives

Another outstanding feature is the shock-mounted 3½" drives, which pop up for convenient loading, with their LEDs in plain sight between them. These drives are being heralded as the new standard. IBM's PC AT can accept the 3½" drives as an option, and they have dropped the 5¼" drives as part of the standard package for their new Personal System/2 models. These compact drives can be added as optional accessories to Heath/Zenith's older IBM compatibles. Some new IBM software is being marketed with both sizes of disks in one package.

The advantages of 3½" disks include ease of handling, small size, and a storage capacity double that of standard 5¼" disks. Also, the disk is quite rugged; it is enclosed permanently in a hard plastic container with an aluminum sliding screen covering its read/write access window. (It is quite true that a 3½" disk can be carried safely in a pocket, but I

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B	Boot
C	Display 16 color bars, to adjust an RGB monitor
D	Display memory in hex by address and range
E	Examine a memory byte
F	Fill memory from list
G	Execute (go)
H	Math in hex
I	Display contents of a port (input)
M	Move a block of memory
O	Output to a port
R	Examine contents of a CPU register
S	Search memory for a string
T	Single-step a trace through user program
U	Disassembler
V	Set video/scroll mode

Table 1. Commands available through monitor routines stored in the Z181's read-only memory.

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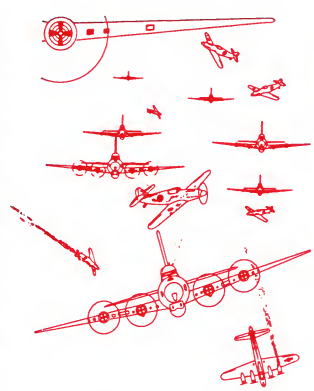

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suspect it should first be slipped into the dustproof plastic sleeve in which it is usually delivered.)

The future of the 3½" format looks promising; several firms have already announced pilot production of 3½" disks; using improved drives and thinner disk coatings, 3½" disks can have storage capacities of from two up to seven megabytes. Seagate Technology (remember Alan Shugart, who produced some of the first disk drives for desktop computers?) offers a 30-meg Winchester that fits into the same 3½" drive-space configuration. So we are slipping into a new generation, much as we did in yesteryear when 5¼" disks became more popular than 8" disks.

(There is an important note in the Technical Reference Manual, by the way. It states that the dummy disks shipped in the drives should be *inserted* when the Z181 is carried any distance—a point to remember if you frequently carry the computer between floors or between buildings.)

External 5¼" drives

When the Z181 first came out, some people told me that you needed special software to transfer data from 5¼" to 3½" disks. Contrary to those reports, I found that isn't necessary. A rear-mounted socket accepts a cable connection to two 5¼" drives, 40- or 80-track, single- or double-sided, and the Z181 can be configured to read 320K disks. (MS-DOS's DRIVPARM command takes care of this. See below about including a suitable command line in your CONFIG.SYS file.)

This was important to me because most of the software already available was on 5¼" disks. However, in October 1986 the interconnecting cable was not available, so I had to make one myself. Fortunately, a cable is now available from Heath (part number HCA-76), so hooking up a 5¼" drive should be no problem at all.

The multi-function monitor

If you have had a Heath/Zenith computer for any length of time, you may have had occasion to use the built-in monitor routines stored in the computer's read-only memory (ROM). If you don't have auto-boot enabled, of course, you use at least one of them—every time you hit "B" to boot. And if you have ever had a bad memory chip, the memory test has come in handy.

Such user-accessible routines are unusual in laptops; even some manufacturers of desktops do not provide them. Heath/Zenith, however, did not use portability and small size as an excuse to scrimp. In the Z181, a full complement of routines is included in the ROM-resident Multi-Function Monitor MFM-180. MFM provides a real-time clock and calendar, and an automatic test of vital functions during the power-up cycle.

The monitor program allows the user

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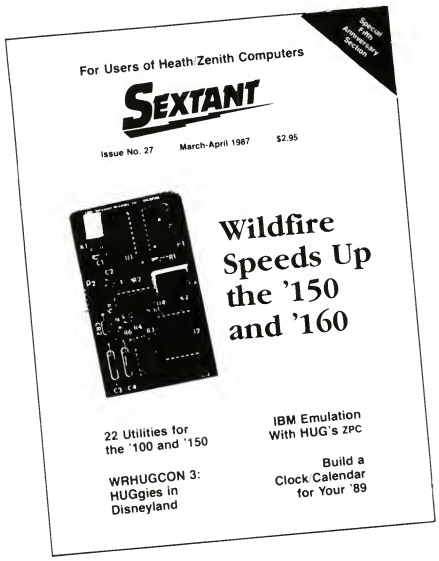
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to access very complete diagnostics of disk drives, keyboard, and memory. You can interrupt these long tests at any point. A full menu of commands is presented on the screen when you invoke the monitor routines by means of Ctrl-Fn-Alt-Del followed by a question mark. (See Table 1 for a list of these options.)

Many owners may never use the monitor program unless drive A: proves balky—it lets you key in B1 to boot from the second drive, or B2 to activate the 5¼" external drive. Nonetheless, such a completely controlled monitor program in a laptop is just one more indicator of real value.

The clock

Besides providing diagnostics, the monitor routines may come in handy in dealing with the '181's clock/calendar.

The boot routine normally displays the date and time when booting is completed; you can then acknowledge with RETURN, or insert a correction. But that correction will last only until the computer is shut down.

To apply a correction that will continue after switch-off, you will need to use the RTCLOCK program that's supplied to set the Z181's clock/calendar. Unfortunately, the RTCLOCK version that I have would not work. However, I received instructions from Zenith telling me what to do.

Frankly, I'm not sure what the bug is or what the correction procedure really accomplishes, but it involves outputting values to three port addresses (5D, 5C, and 5B hex).

To do so, first go into the monitor program (Ctrl-Fn-Alt-Ins). At the monitor prompt (–>), enter:

O5D,3<RETURN>
O5C,0<RETURN>
O5B,0<RETURN>

Then, with the system disk in drive A:, hit Ctrl-Alt-Del to boot MS-DOS. Enter RETURN at the time and date prompts, and only then do you enter

RTCLOCK mm/dd/yy hh:mm:ss
<RETURN>

to set the clock/calendar.

Battery power—it's handy

My Z181 uses a ten-celled Sanyo battery called a Cadnica. This appears to be an ordinary nickel-cadmium battery, and similar to those that have been widely used in portable transceivers since the early '70s. Each cell measures about 2" by ⅞", and has a nominal voltage of 1.2 v, with a capacity of 1500 milliampere-hours (mah).

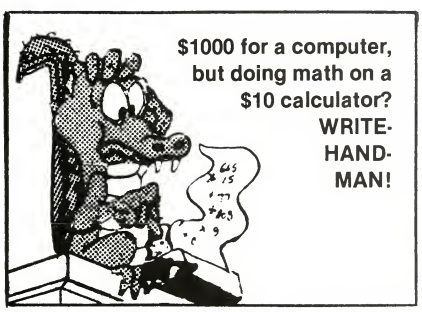
The Z181 is powered much like some cassette recorders. Battery power is available all the time; to run off AC power or charge the batteries, the charger is part of the plug that goes into the wall socket.

This way of doing things has the great advantage of fitting the computer with an uninterruptible power supply, a feature that would have added at least $500 to a desktop computer. Unlike many laptops, the Z181 is indifferent to plug-in or disconnection of the external power.

This saved me grief in the very first month of operation: while I was transferring a program from the external drive, the 120-v AC was cut off for a few seconds. Fortunately, only the 3½" drive was running at the time, so no data was lost.

(Zenith suggests that if the laptop is going to be using AC power for an extended period of time, the battery should be charged and removed.)

A side benefit is gained by having the charger in a separate unit. It avoids the greatest single challenge to a computer's



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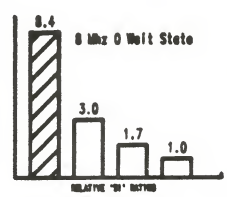

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reliability—heat radiated from a power supply.

. . . but follow directions

Perhaps the major complication to using a battery-powered computer arises from the need to regularly recharge the battery. When the "Low Power" LED starts to blink, it is obviously time to recharge. But a number of people have been irked by the fact (noted in the Owner's Manual) that you must always remember to unplug the charger from the wall and remove it from the computer after twelve hours. Surely it would not have been much of a problem to have inserted another LED to show when the battery is fully charged. Any technician who has serviced nicad batteries can verify this.

Charging nicads does require care—you don't want to charge them too much or let them fall too low.

Charging nicads does, however, require some care. First, you don't want to charge them too much. The Technical Reference Manual states that eight hours is sufficient to charge a fully discharged battery; more than 12 hours actually starts to cause damage.

Also, you shouldn't let them fall too low. Once a nicad's voltage falls well below one volt, there is a chance it will reverse its polarity, causing gas to be vented and permanent failure of the battery.

I don't think there is too much danger of this happening with the Z181, however. The manual indicates that the battery is "fully" discharged when the blinking "Low Power" LED goes out. But I found out that operation will fail while the LED is still blinking: the screen gets quite dark, and then in a few minutes the system crashes.

The most likely problem is that you might charge the battery too often. Zenith instructs you to periodically allow the battery to become "fully" discharged, and then follow that by a full charge.

If nicads are repeatedly charged after they are only partly discharged, they build up a memory of this short service cycle (sometimes called a "high ledge"). If the practice continues, it results in perhaps only an hour of use (maybe even just half an hour) instead of four or five.

Often, this high ledge can be changed to a low ledge by discharging the battery fully. To do so, run the disk test until the "Low Power" LED goes out. (I found that, although the keyboard will refuse to take commands, the disk drive operates continuously until the light goes out.) Then fully charge the battery. Repeat this cycle three times.

When nicads were still very expensive, I worked with them at a marine-electronics service section. We rejuvenated them with several cycles of full charge and discharge, followed by a final charge at 500 milliamperes for four hours. During most of this time, the battery has a plateau voltage of 1.25.

When full charge is reached, the

Late News on the '181—and the '183

Just before press time, Zenith Data Systems announced an enhanced version of the Z181; this new '181 includes upgrades in three areas.

First, the new '181 lets you switch processing speed between the standard 4.77 megahertz and 8 MHz, about 60% faster.

Next, the newer units provide about 40% more battery life. The battery can now power the computer for an average of four to seven hours between charges—depending on speed of operation and number of disk accesses.

Finally, the enhanced '181 allows you to add an external hard-disk drive—powered by ordinary AC. (An external 20-megabyte drive is offered for $1,299.)

The enhanced version of the Z181 should be shipping by the time you read this. However, actual availability may depend on such considerations as dealer inventory. You may wish to inquire about the features of the version being offered.

The Z183 includes a 10-megabyte hard disk, plus a single 3½" floppy drive. Its case is slightly larger than that of the '181, and includes a handle. A 2.5 amp-hour battery is standard, and a 4 ah pack optional. Operation on battery power is said to vary between two and five hours, depending on battery size and the amount of disk access.

Another option promised for later in the year is a megabyte of Expanded Memory Specification (EMS) RAM. The 15-pound Z183 has a suggested retail price of $3,499.

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voltage suddenly rises and the charging should be terminated. However, if the charging current is reduced to about 100 ma at this point, there is little likelihood of damage.

A variation of this procedure is used by Black and Decker in their top-rated DustBuster. This hand vacuum has a three-cell 1500-mah battery, which can be kept on continuous charge at 105 ma (reaching about 1.37 v per cell). After four years, my DustBuster and its battery are still giving excellent service.

This technique would not meet Z181 requirements, however; the power supply has to deliver 850 ma when a drive is running and the screen is at full brilliance. With the computer turned off and the battery almost fully charged, the output of the charger is 19 v DC at 270 ma. That's too high to be left on past the maximum twelve hours, so I use a household timer to turn it off.

Because we should watch out for these voltages, a valuable guide would be provided by the addition of a zener diode and an LED that would trigger at the manufacturer's recommended voltage point. (In my unit, the fully charged battery standing overnight stabilizes at 13.3 v, and a short charge raises it to 13.95 v, no load.)

Documentation and technical help

Zenith's Owner's Manual for the Z180 PC Series Computers has 44 pages of easy-to-understand instructions. Although it is a bare-bones approach, the manual will help an owner operate the Z181. If additional assistance is required, the reader is instructed to contact an authorized ZDS repair facility.

One of Zenith's Z181 brochures said there was a special telephone hotline for technical and software problems. But it did not give the number, and I was unable to find anyone who knew about it. The 800 number listed by Zenith in a promotional release is limited to mailing advertising literature and promotional releases.

After numerous phone calls and letters to Zenith, however, I was able to get a photostat from a contractor's manual showing the pin designations for the EXT FDD plug. This apparently wore out my welcome; I never succeeded in getting through to a knowledgeable Zenith representative with technical questions. Eventually, I went to the people at Heath. They were wonderfully helpful—including those busy technical assistants in the computer hardware and software departments.

Because the Z181 is an imported computer, there were apparently a few bugs to work out in supporting it. Now, however, the technical support is being handled through the normal channels.

Although Zenith introduced the Z181 in June 1986 and scheduled an Owner's Service Manual for December, it was not available until April of this year. I am looking forward to using it to learn more about this admirable computer.

The Z181 comes with MS-DOS 3; the MS-DOS User's Guide published by Zenith Data Systems is unusually handsome, with high-quality paper and print. Another admirable feature is a new style of plastic multi-ring binder. The book can lie open flat, the pages can be easily turned, and it is easy to insert or remove pages if changes have to be made.

One of the first items that I found valuable was the manual's explanation of CONFIG.SYS, an ordinary text file you create in order to give MS-DOS some basic information about how you want your system configured. My CONFIG.SYS file now includes the following lines:

```
DEVICE = RAMDRIVE.SYS 384 512 64
DRIVPARM = /D:2/F:0
```

My experience makes me confident that compatibility will not be a problem for the Z180 series.

Here, 384 sets the RAM disk's size in kilobytes; 512 sets the sector size in bytes; and 64 sets the maximum number of entries in its root directory.

In the DRIVPARM line, the /D switch allots a specific drive number (2, drive C:); the /F switch indicates the particular type of drive. (Here, zero is for a 5¼" 320K drive.)

Using RAM to masquerade as a disk drive is usually done for the speed gained—even though there's the risk that you'll lose data if you lose power. Speed is not a RAM drive's only virtue, however. Disk drives consume considerable battery power when running programs that have to access files on disk—using the RAM drive saves wear and tear on batteries as well as on disk drives.

Software

Every user has a pet program. So, you may be wondering whether your favorite program will run on the Z181. Unlike the Convertible, IBM's laptop, the Z181 accepts virtually all IBM-PC-compatible software, including such brain-busters as dBASE III Plus, SuperCalc, and Lotus 1-2-3. Heath/Zenith's first listing of compatible software (issued in August 1986) included almost 150 programs. And my own experience makes me confident that compatibility will not be a problem for the Z180 series.

Conclusion

Only three years have passed since two outstanding computer consultants pre-

The Z181 Technical Reference Manual

Zenith issued the Technical Reference Manual for the Z181 in early April, and its 400 pages form a companion to the MS-DOS manual in both appearance and presentation. The narrative is most informative and is reinforced by three schematics (power, processor, and video), 156 tables, and 110 figures. Approximately a score of the figures are evenly divided between block diagrams and pin-outs.

This manual will be invaluable for those users who have some background knowledge of computers, as well as for those who plan to write programs for the Z181. Repair technicians will have to be content with this manual until a planned service manual is released.

An 18-page chapter on mechanical disassembly describes troubleshooting techniques that may be performed by the user. Large and informative sections of the manual are allotted to the processor, support circuitry, memory, and video circuits. Typical of the manual's thoroughness are the pages dedicated to timing-pulse diagrams and to character-font design.

Examining this manual, you will recognize the same level of competence that characterizes the laptop itself.

dicted what they thought portables would look like when the market had matured. (See David and Peter Winer's article "Portables—1984 and Beyond," in *Byte*, January 1984.) They felt that the highest level of portable would have a large memory and a disk drive. And at the time, it appeared quite realistic for them to predict that such a computer might weigh as much as 25 pounds. Heath/Zenith has surpassed this forecast easily.

The computer industry produces an endless stream of new products, a process perhaps paralleled only by the publishers of books. More interesting, though, is that people find that their computers have such a personal appeal that they award them names. (The author and columnist Jerry Pournelle calls his favorites Golem, Big Kat, Zeb, and Lucy.)

The Z181 has a curious set of attributes, almost a charisma, accented by contrasts. When closed and secured with its precise twin sliding locks, its neat packaging invites handling, but as soon as it is grasped, the muted contours and smooth surfaces draw attention to the fact that there is no handle.

When it is open, we find a keyboard and a lifeless screen; pushing two sliders reveals the complex disk-drive mechanisms. When it is turned on, there will be a right-pointing arrow to show that you are in the monitor program. All very business-like. But when the "C" key is pressed, the monitor's multi-bar graph displays a variety of hues much more spectacular than a monochrome CRT.

From that point on, every program that is run extends the wonder that so much power can be contained in such a small package. The Z181 has real character; in fact, I had to compare it to the power of an oracle. The name Cassandra immediately came to my mind. (Some might observe that her prophecies were gloomy, but I recall that she was always *right*.)

Computers are tools that extend the boundaries of our intellect and cognitive skills. The handier we can make this tool, the more beneficial it will become. Since the Z181 shrinks a full-function computer down to the size of a large book, it is difficult to imagine real improvements, except perhaps more speed.

Legend indicates that Merlin, more than 1,500 years ago, said that if anyone dared to make predictions, revisions should be planned every few years. As near as I know, he didn't venture into prophecy until he had reached such a ripe age that faulty predictions would be less likely to bounce back during his lifetime.

I am pretty sure I haven't reached that stage in life, but I must confess that I was building super-regenerative broadcast receivers for sale 65 years ago. And before retiring to Florida nearly 30 years ago, I had many experiences with early computers, going as far as some of those used by the military back in the late '50s.

So, with that set of qualifications, I'll be foolhardy and predict that in the next three years we will see flat color screens suitable for laptops, and laptops will become invaluable as personal advisers in accounting, law, and medicine, and will also handle our banking.

About that same period, laptops will begin to take our verbal dictation—*if* we are willing to take the time to precisely pronounce our vocabulary.

Right now, I am exquisitely pleased with Cassandra.

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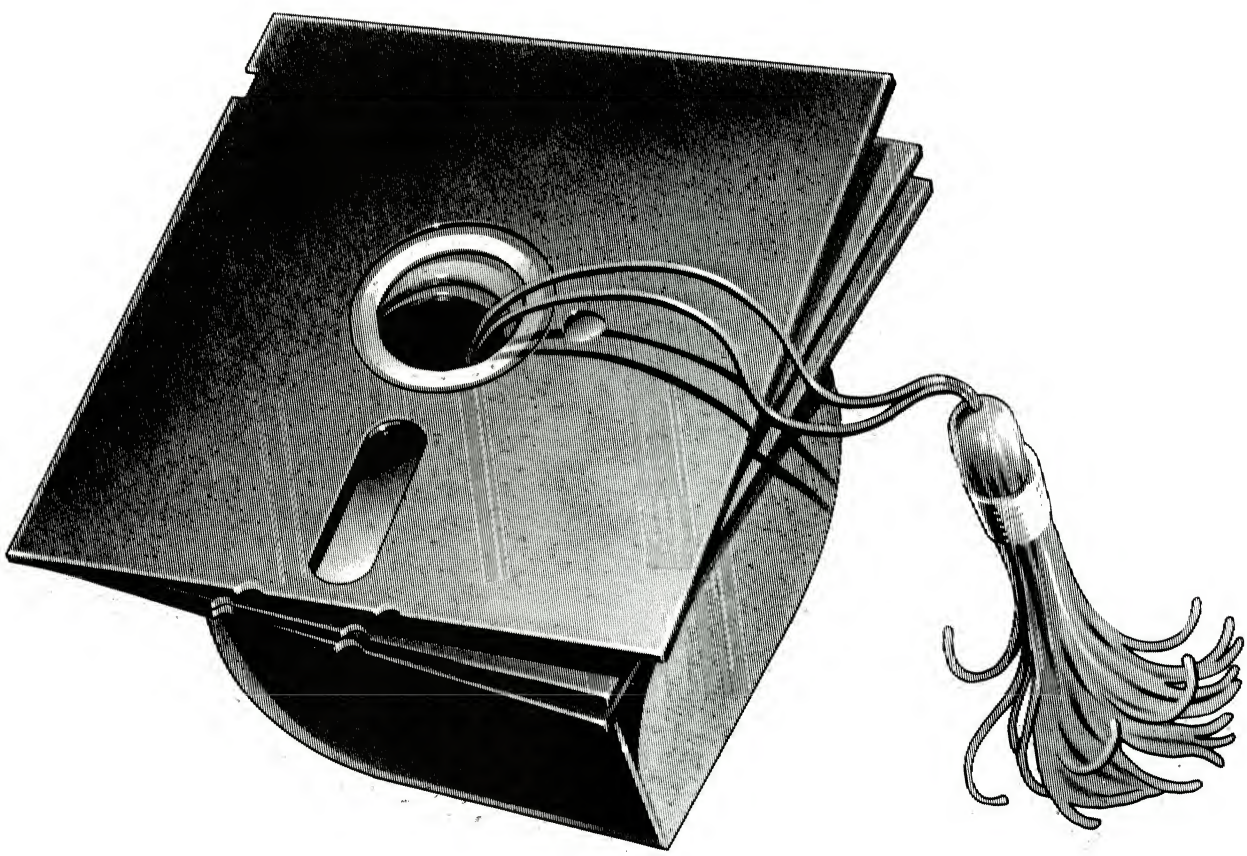

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Z100 Typesetting: Better than Desktop Publishing

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John N. Serio

In the fall of 1983, Clarkson University implemented its plan of providing students with personal computers by issuing Zenith Z100 desktop computers to entering freshmen and to faculty. I was then the newly appointed editor of *The Wallace Stevens Journal*.

This scholarly journal is devoted to the study of the poetry of Wallace Stevens, an American poet who lived from 1879-1955, and who for years was vice-president of the Hartford Insurance Company. As a result of my activity in The Wallace Stevens Society, which publishes the *Journal*, I became editor that fall, and both the Society headquarters and the *Journal* moved to Clarkson, here in Potsdam, New York.

I had guest edited the *Journal* in the past and had no fondness at all for the process of proofreading the galleys, sending corrections back to the typesetter, proofreading the corrections—and then, if necessary, sending *them* back again. It was laborious, time-consuming, and—to say the least—frustrating. It seemed that a lot of good effort was being wasted as new errors crept in at every juncture.

So, I decided to see whether my Z100 could help in editing the *Journal*, if only to test whether it could eliminate those irritating problems in an efficient and economical manner.

With all the fuss that has been made about desktop publishing, some might think that I would have preferred that Clarkson had chosen the Apple Macintosh instead of the Z100. It's only recently that desktop publishing has been making inroads into the IBM-compatible world, and none of the programs I've seen described will run on a Z100.

However, the laser printers that are driven by the desktop-publishing programs typically provide a considerably lower print quality than is available from professional typesetting companies. And those printers typically start at around $2,000-$3,000. Using my regular word processing program on the Z100, I was able to get the higher quality at a very reasonable price.

I had to learn only a handful of formatting commands.

The typesetter

I located an article in the June 1983 issue of *Personal Computing* that discussed how one could control typesetting with a personal computer. (See "Professional Typesetting With Your Computer," by John King.) A number of typesetting firms equipped to handle electronic data transmission were mentioned, and I wrote to them for information.

Robert Badaracco, President of Grapheions, Inc., of Teaneck, New Jersey, responded with the most specific information, so I selected his firm. In addition to a reasonable cost quotation ($2.50 per thousand characters), he included a master list of typesetting commands, which were to be embedded directly in the text to control the typesetting.

He also included information on the communications protocol he used, giving the more common settings for baud rates, parity, stop bits, etc. This would allow my personal computer to exchange information with his computerized typesetting system. Additionally, he provided the number for a toll-free data line which would allow customers to send material free of charge and at their convenience, 24 hours a day, seven days a week.

Since the general format of the *Journal* was fairly simple, and remained fairly constant, there were only a handful of formatting commands I had to learn—such as how to place article titles in boldface, how to set up paragraphs and block quotes, how to move between regular typeface and italics, and how to change type size when going from regular text to footnotes.

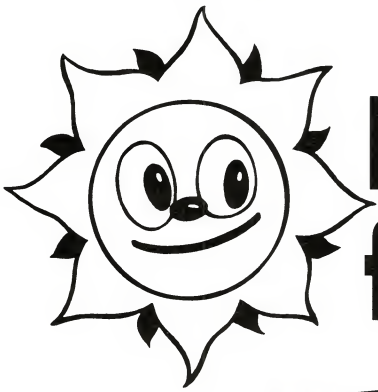
The commands

Grapheions' computerized typesetting system is known as Typeline. The typesetting commands used are ordinary text characters enclosed within square brackets and placed immediately before the text to be changed. For example, [helvetica], [HELV], and [helv, b] are different ways the Font command can be typed, each specifying Helvetica as the typeface to be used; the last example specifies the boldface attribute.

The main command syntax used by Typeline is quite straightforward—sometimes simply the insertion of a single command. For instance, [in] is placed at the beginning of a paragraph to indicate your normal paragraph indentation. Sometimes the command takes the form [command 1,2,3] for more complicated changes. For example, [helv b,c,i] would give you the Helvetica font, with bold, condensed, and italic attributes. (See Table 1 for an overview of the commands used by Typeline.)

Several commands require you to specify measurements (e.g., how big to make the characters, how long each typeset line is, how much vertical space to skip). There are five possible units available. Measurements can be given in

John N. Serio is an Associate Professor in Humanities at Clarkson University. The school's decision to supply Z100s to faculty and students ushered him into the world of computing.



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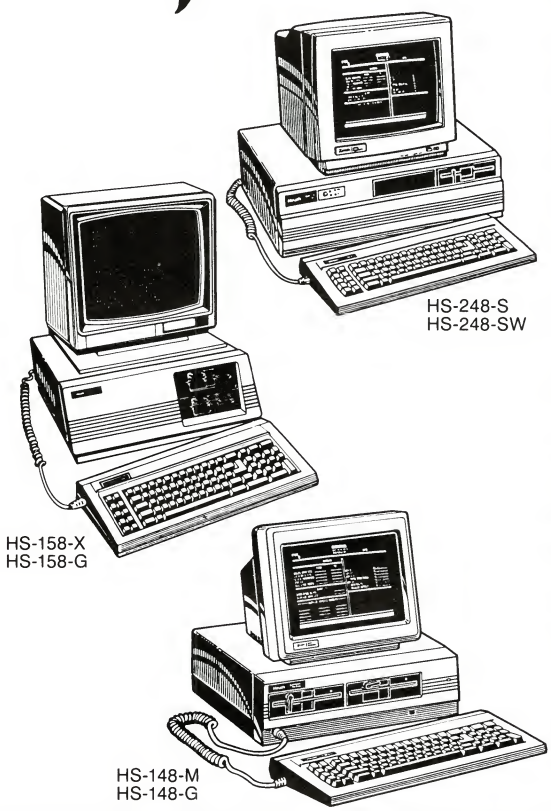

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either standard typesetter's terms (points and picas), or in more common measurements (inches, centimeters, and millimeters).

Table 2 uses the line-length command [ll <m>] (where <m> indicates a measurement) to exemplify the usage of the various units of measurement. All of the examples are the same length.

The word processor

Those familiar with word processing should not find it difficult to incorporate Typeline's commands into their text. The major point is that your word processor should be able to produce relatively "plain-ASCII" text files. Some programs invisibly embed control and ESCape characters in the file in order to handle formatting. If so, they usually provide a mode that produces clean files. (WordStar, for instance, refers to this as the "non-document" mode.)

Many times, however, adapting to a typesetter is simply a case of substituting one formatting command system (the typesetter's) for another (the word processor's).

For example, I use Galahad, the word processor Clarkson University developed for the Z100. In order to indicate a paragraph indentation in the version of Galahad I initially used, I had to type .p before the first word of the new paragraph; Typeline calls for [in] to precede the first word. In Galahad, to indicate a mandatory carriage return (as at the end of a paragraph), I had to use .b; for Typeline, I have to type [p].

(Those features are now fully automatic on Galahad, by the way. Galahad continues to undergo changes as Clarkson users provide more feedback. For a look at Galahad, see *Sextant* #15, March-April 1985, "Galahad: Clarkson's Gift to the '100," by John W. Thorne.)

There was one difficulty, however, with substituting Typeline's commands for Galahad's: I could not get a printed copy of the articles with the regular typewriter formatting, such as double spacing, indentation, underscored words, etc. The reason was simple: Galahad cannot recognize the processing symbols that Typeline uses. (However close it may be, .p is not [p].)

This stumbling block was easily overcome, however, by using Galahad's "List Print" (or "Verbatim") function. This type of printing allows me to get a printed copy of exactly what is displayed on the screen. It does not "process" the symbols to give me a formatted paper, as in the normal print mode; rather, it lists them, along with the text, just as they appear on the screen. I use this list-printed version to compare the manuscripts against the originals to make sure that both the text and typesetting commands are accurate.

Figure 1 is an example of how a page looks (both on the screen and on paper) with the embedded typesetting commands.

Command	Function
Commands governing main parameters	
[(name/#)]	Font name or number
[ch <m>]	Character height with automatic linespace
[ll <m>]	Line length
Make-paragraph commands	
[p]	Justified, (flush left, flush right)
[pl]	Flush left, ragged right
[pr]	Flush right, ragged left
[pc]	Centered, ragged both sides
Indentation commands	
[in]	Indent beginning of paragraph
[in <m>]	Indent with <m> amount of space
[inl <m>]	Indent paragraph left
[inr <m>]	Indent paragraph right
[ins <m>]	Indent paragraph symmetrically
[inh <m>]	Indent hanging
[out]	Outdent—move out of last stated indent
Miscellaneous commands	
[fr /]	Fraction
[ns #]	Superscript (number superior)
[ni #]	Subscript (number inferior)
[ac_]	Accent

Table 1. Summary of commands used in Typeline, Grapheions' computerized typesetting system.

Measurements:

Form	Units	Example
x	Points	[ll 324]
xp or xP	Picas	[ll 27p]
x″ or xi or xI	Inches	[ll 4.5i]
xm or xM	Millimeters	[ll 114.3m]
xc or xC	Centimeters	[ll 11.43c]

Table 2. Several commands in the Typeline typesetting system require measurements (e.g., how big to make the characters, how long each typeset line is, etc.). There are five possible units of measurement available. The table above uses the line length command [ll <m>] (where <m> indicates a measurement) to exemplify how one indicates the various units. All of the examples specify the same length.

The spelling checker

As a double-check for accuracy, I apply The Random House ProofReader to all the articles before I list-print them. This electronic speller compares every word in a file against the 80,000-word Random House dictionary on disk, and displays all the words that do not match. It is a quick and efficient way to catch misspellings and typographical errors, especially those thorny transpositions that the eye may "correct" while readnig.

Making corrections in the text is easy with the correction feature of the dictionary. The dictionary displays two lines of text with the unknown word highlighted. I am then presented with a number of options: I can accept the spelling of the word or correct it, and I can look up the spelling in the on-line dictionary. I can also add the word to the dictionary. This "learning" feature is quite useful, especially given the number of frequently used proper names, such as "Wallace Stevens." When I'm finished, the dictionary writes the corrected version of the article to a new file, while renaming the original file as a backup copy.

The dictionary, of course, does not eliminate the need to manually compare the computerized version with the original manuscript. (For instance, the spell-

```
[pal,b][ch 12][ll 27.5p]
The Wallace Stevens Journal[pc][p]
[ch1Ø]
Volume IX[in]Number 2[plx]                Fall 1985[pr][p]

Contents[pc][p]

[med]
Samuel French Morse: A Letter and Three Poems[fill].67[p]

Wallace Stevens' Sky That Thinks[p]
[in 14p][i]--Dorothy Emerson[xi][fill].71[p]

Concepts of Irony in Wallace Stevens' Early Critics[p]
[in 14p][i]--Melita Schaum[xi][fill].85[p]

Allusions to Keats in Wallace Stevens' "Autumn Refrain"[p]
[in 14p][i]--Mary Joan Egan[xi][fill].98[p]

Harold Bloom's "Notes" Toward Self-Canonization[p]
[in 14p][i]--Lynda R. Goldstein[xi][fill].1Ø1[p]

Poems[fill].118[p]

Reviews[fill].121[p]

[ch 7.5]
Cover by Kathy Jacobi--[i]Samuel French Morse[pc][p]

[in]The Wallace Stevens Journal [xi]is published biannually (Spring, Fall)
by The Wallace Stevens Society, Inc.  Administrative and editorial offices are
located at Clarkson University, Potsdam, NY 13676.  Subscription rates are
$15.ØØ for individuals ($25.ØØ for two years) and include membership in The
Wallace Stevens Society, Inc.  Rates for institutions are $2Ø.ØØ per year (add
$2.ØØ foreign).  Back issues are available upon request.[p]

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submitted in duplicate and accompanied by a self-addressed envelope, with
loose stamps attached.[p][p]

[b]The Wallace Stevens Journal[pc][p]
[med]
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ISSN Ø148-7132[pc][p]

[EOT]
```

Figure 1. The computer file of a page with Typeline's embedded typesetting commands. See Figure 2 for the typeset version.

ing checker does not know the difference between "from" and "form".) Nonetheless, the electronic speller certainly makes my task much easier; I do not have to get lost in the myopic world of individual characters while proofreading. I can concentrate more on content and style.

Macros

One more element of automation can be added if your word processor supports macro commands. With some word processors, you can create disk files with word-processor commands typed in as ordinary lines of text. Running the macro file executes its series of commands. Different word processors may handle macros differently.

Galahad, for instance, allows me to store often-used commands under assigned keys, in what is known as a meta-key level: Home plus the assigned key.

Thus, in order to set up the typesetting parameters for a new article, I simply press Home and the letter a. In return, I get the following typesetting command sequence: [pal,b] [ch 12] [ll 27.5p]. This selects the Palatino font with an attribute of boldface, a character size of 12 points, and a line length of 27.5 picas. (I'm a purist and use the formal

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But what if you don't have a modem?

Then you're dependent upon the typesetting company's being able to read your disks. Grapheions, for instance, can handle Apple disks, but not Heath/Zenith formats.

Those of you who wish to be able to mail disks to your typesetter have to make sure that the company at the other end can read them. Micro World Publishing in Northfield, Minnesota, and Techni-Process/Computer Press in Los Altos, California, are two companies that have generally been able to read all Heath/Zenith formats—hard- and soft-sectored—and all Heath/Zenith operating systems—HDOS, CP/M, and MS-DOS.

As an example of cost, Micro World charges $2 per thousand characters in your data file.

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507/645-4611

Techni-Process/Computer Press
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415/949-1765

typesetter's terminology.)

When I have to switch to italics, I simply press Home and the lowercase letter i to get [i]; to turn off the italics, I press Home and the uppercase letter I to get [xi].

Also, I have set up a key to handle common citations. We use the standard edition of Stevens' poems published in *The Collected Poems of Wallace Stevens* (Alfred A. Knopf, 1955); I simply press Home and the letter c for the following command sequence needed for a citation to this edition:

([i]CP [xi]) [pr] [p] [out]

Using this sequence after an indented poetry quotation allows me to italicize *CP* as an abbreviation for *The Collected Poems*, move the reference to the right, skip two spaces, and "outdent" (move out of) the symmetrical indentation I had previously invoked for the block quote. All I have to do is place the page number after the [xi] command in the parentheses. This macro level not only saves time, but also, of course, improves accuracy.

Others, with different word processors and different typesetting packages, may take a different approach. For instance, you might indicate the beginning and end of a particular typeface by some infrequently used characters. ("Curly brackets"—{ and } —could indicate italics; other characters would be used for other type styles, sizes, etc.) These are relatively simple to type in, and leave the text copy relatively uncluttered. To support this strategy, you would write a set of macros to change those symbols into whatever the typesetter expects. (This is what they do at *Sextant*.)

However you do it, I think you'll find that you really need macros or some other form of automated handling to simplify inserting the typesetting codes. Doing it by hand becomes increasingly error-prone as your formatting requirements become more complex, and when font and size changes are made frequently within articles.

The modem

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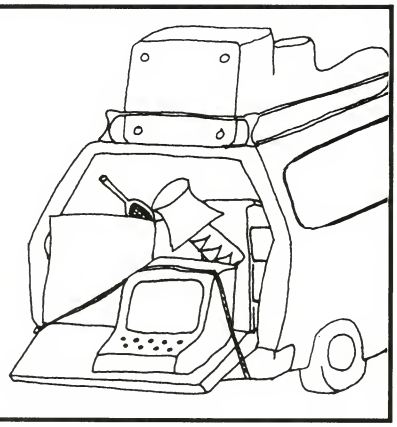

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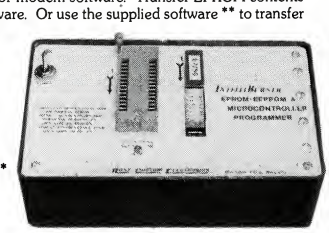

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I feel confident that the issue is ready to be typeset, I transmit the issue to Grapheions electronically.

Starting out, I found I needed three items: 1) a modem, which would connect my computer directly to a telephone line (hardware); 2) a communications program that would enable my computer to interact with the modem (software); and 3) a person; in this instance, David Bray, Dean of Educational Computing at Clarkson, who would know how everything worked (humanware).

Typeline has a standard communications program that allows the Z100 (and most other personal computers) to link up with its Compugraphic MCS 8400 phototypesetting machine. Doing this for the first time called for some technical expertise, however, and David Bray showed me how to use the communications software to configure the Z100 so that it could communicate with Typeline's typesetting machine.

In case you're interested in the technical details, I had to configure my Z100 to transmit data at 1200 baud, half-duplex, with line feed, no handshaking, two stop bits, even parity, and 7-bit words. (Now you see why I needed David Bray.)

I used a Hayes Smartmodem 1200 and called (that is, typed in on the computer) the phone number of Typeline's toll-free data line. I watched in delight and, in fact, sheer amazement as line after line of text flashed across my screen as the articles were being telecommunicated from Potsdam to Teaneck. At the rate of approximately 30 words per second, it took about half an hour to transmit a 55-page issue, a total of over 155,000 characters.

At a cost of $2.50 per thousand characters, the bill for typesetting was roughly half the normal fee we had been paying. But the real reward came in accuracy. The camera-ready galleys, which arrived—believe it or not—within two days, were not only of the highest quality, but were also error-free. There was no need for me to send corrections back to Grapheions; in fact, I did not even have to proofread the galleys again. A quick glance over them assured me they were as accurate as what I had sent down.

Figure 2 shows a sample of the typeset finished product.

The benefits

As you can see, I had an unusually positive first-time experience in using my Z100 to edit *The Wallace Stevens Journal*. Since that time I have edited more issues, as well as a book, on the computer—with the same results. On rare occasions, a character or two will get garbled in transmission and I will have to resubmit a paragraph. Now, however, I use a telecommunications program that supports the XMODEM error-checking protocol, and I have eliminated this problem.

The Wallace Stevens Journal

Volume IX Number 2 **Fall 1985**

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Cover by Kathy Jacobi—*Samuel French Morse*

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Figure 2. Final typeset copy of the file shown in Figure 1.

Typeline, by the way, has its own error-checking program. It may find that you have submitted a file with wrong commands, such as using the number 1 instead of the letter l for line length. Or you may have used unnested commands, such as turning italics on and forgetting to turn it off. If so, the program will note lines where the errors occur and give you the opportunity to scratch the job. (If your word processor supports macros, you can write some to do much of this yourself.)

What I appreciate most in using my personal computer to typeset the *Journal*, however, is the control: my meticulous efforts during the initial process of proofreading are not lost at some compositor's desk, for there is no need for anyone to re-keyboard the text.

In addition, now that I have become familiar with the entire process, I'm less hesitant about trying various ways of setting up issues. One manuscript, for example, had a table in it which I felt interrupted the flow of the article. At one time, I might have considered sending the table to a conventional typesetter. This time, I simply used Galahad's block-delete feature to take out the table, and then "undeleted" it at the end of the essay; then I reduced the point size, and called it an appendix. It was an easy solution to what could have been an expensive problem.

There are other advantages to using a personal computer in the editing process that I had not anticipated. One is that it creates inexpensive and compact files for permanent storage. A couple of issues of *The Wallace Stevens Journal* can easily be stored on one floppy disk. If the need ever arises for me to locate something in a published article (as I had to do recently), I can locate it within seconds by using

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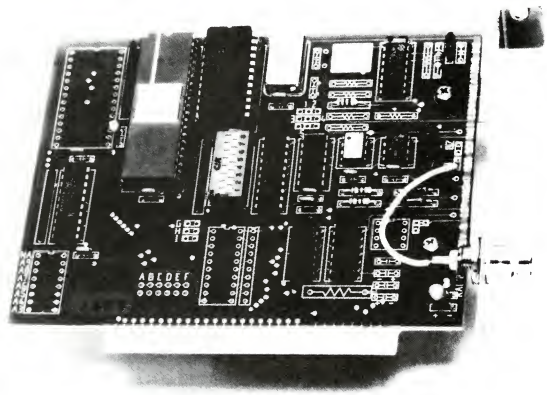

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the word processor's search function. In addition, the electronic proofreading program gives an immediate word count of each article, so maintaining uniformity in issue length becomes easier.

Now that more and more scholars are using personal computers, I have been able to realize another benefit. Authors who have written their accepted manuscripts on personal computers can transmit their papers to me with a modem. In a matter of minutes, I can have a 20-page essay written to my disk.

This saves time and money, since I do not have to hire a typist. Besides that, it also improves accuracy, for with every retyping, errors are invariably introduced. After receiving the article electronically, all I need to do is format it for Typeline. Thus, from original composition to publication, the essay needs to be typed only once—and that's done by the author.

The future

Much has been written lately about desktop publishing, and I anticipate in the near future using software that will enable me to do the page layout of the *Journal* right in my office. This kind of page-composition software would be extremely helpful in arranging and organizing an issue. It would eliminate the need, for example, to make a "dummy" of the issue to see where articles would end, for the whole issue could be previewed on the computer in advance. If necessary, articles could be moved around electronically for a better arrangement, and page numbers and headers could be assigned automatically.

But, as I mentioned at the beginning of this article, there are two reasons I would still want to transmit the issue to a typesetter who supported such programs, rather than print it on one of the laser printers currently popular in desktop publishing.

The first reason is that the quality of professional typesetting is superior to a laser print-out. A high-resolution typesettting machine, such as the Linotype L100, can produce output of 1,270 dots per inch, whereas most office-level laser printers can provide only 300 d.p.i.

The second reason is cost. Typeline does support desktop publishing software, at a cost of $8 per page. That is a lot more economical than spending about $3,000 for a laser printer that can provide only one-fourth the resolution of a high-end photo-composition machine, such as the Linotype L100 (which currently retails for $30,000-$35,000).

The process of using a personal computer to control typesetting may also be useful to those who aren't involved in journal editing. You can use this method, for example, to typeset a report, proposal, chart, *curriculum vitae*, or in-house newsletter. Then, instead of having it professionally printed, you can paste it up on regular bond paper and have copies made by a photo-offset or Xerox machine. At $2.50 per thousand characters, this would be a quick and inexpensive way to enhance appreciably the appearance of your work.

Altogether, computer typesetting is an effective, economical way for Z100 owners to participate in electronic publishing. The price is reasonable, there's no need to invest in expensive printers, and the quality is excellent.

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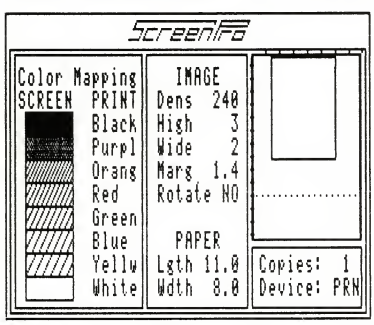

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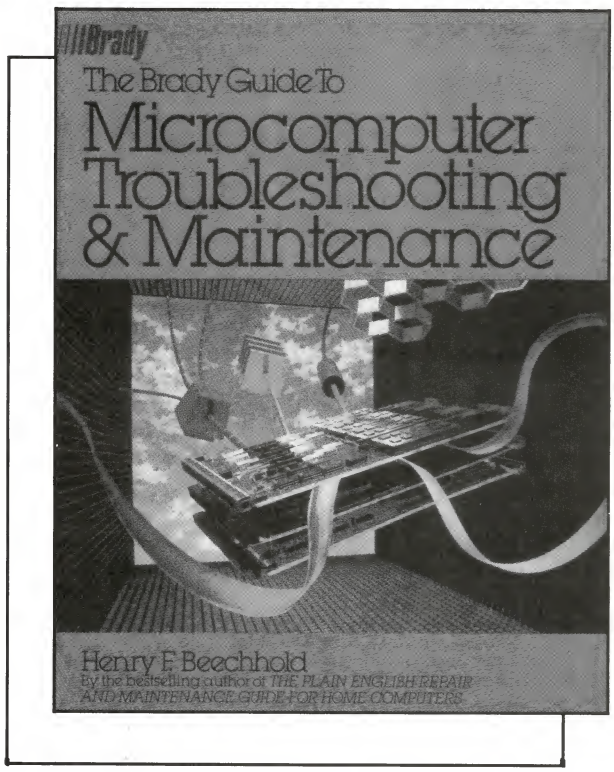
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Making Title Slides on Your '150

The software also runs on the Z100. The photographic technique is applicable to any computer. And to slides of any picture on a CRT.

Gordon W. Nichols

One of the most challenging things a computer enthusiast faces is finding a practical use for the computer after the novelty of owning it wears off. And one of the best applications is to use it in combination with a hobby.

If one of your hobbies is color slide photography, you can use the computer to make titles for slide shows. Title slides can make a home show more interesting, and they can be a major part of business presentations.

All you need is a graphics package that lets you conveniently create the title on screen. After looking around, I chose Doodler-V from Paul F. Herman Inc., of New Port Richey, Florida. (It's available for both the Z100 and for Heath/Zenith's IBM compatibles.) Once I've created the title, all I have to do is photograph the monitor screen.

Without the computer, creating a title can be a major task. I had made title slides for many years using dry-transfer lettering. Each individual letter would have to be transferred from the transfer sheet to white or colored cardboard by rubbing the letter with a ball-point pen.

To make titles with black letters on a lighter background, the sheets were photographed on color slide film; to make white letters on a black background, they were photographed on high-contrast black-and-white negative film.

Making the title was a tedious, time-consuming job. And I was usually short of some letter I needed before I finished the title; not only that, but I never seemed to get the letters in a straight line.

About a year ago, I purchased a 13″ RGB color monitor for my Heathkit H148 computer, and decided to use the computer to make my title slides.

Gordon W. Nichols, besides being an avid photographer and Heath/Zenith computerist, is an electrical engineer for Electronic Data Systems in Arlington, Texas.

My first problem to solve was finding the software for creating the title slides. Before I discuss software, though, I should define my personal aesthetic preferences regarding color title slides.

Good colors

I have found over the years that the most suitable background colors for title slides are black and blue. Black is excellent because the title can be superimposed on another slide when I'm using a multi-projector setup. Blue, as it appears on the computer screen, is cool and non-aggressive. It seems to recede and stay behind the message, and so does not compete with it. Most of the messages we see on television are set against a blue background.

> ***Doodler-V does everything needed for attention-getting title slides.***

In contrast, a red background overpowers everything and often appears to be in front of the message. I decided that only black and blue backgrounds would really be necessary for my computerized title slides.

I have found that the best colors for the message are white, black, yellow, red, and green. These are strong colors, and are saturated enough to attract attention. Magenta and cyan appear to be weak and unsaturated. I seldom use them.

A good size

In making color title slides from a computer monitor, another consideration is the size of letters required for easy reading on the projection screen. The first set of titles I made used GW-BASIC's standard double-wide font (producing a 40-column screen). The letters in this font are eight pixels high (about a quarter-inch high on my 13″ monitor).

When the color slide reproduced the whole monitor screen, many people in the audience had difficulty reading the words 15 feet from a 70″ screen. I could obtain larger letters by using the same size letters and photographing just part of the screen close up; the letters were then readable, but the scan lines and individual pixels became objectionably noticeable.

The answer was to create a font of letters of the actual size needed for the message; in this way, the full monitor screen could be used for each title slide.

Finding a good program

Now, I needed a program that would let me create those characters. However, I could not find a software package for the Heath/Zenith IBM-compatible computers written specifically for making color slides. In attempting to find something I could adapt for my use, I tested several graphics packages and downloaded a few public domain and shareware graphics programs from the local Heath Users' Group bulletin board.

Every one of these programs had some frustrating feature that made it unusable for creating color title slides. None of them provided a way to make a font of large letters (about 1″ high on a 13″ monitor) that were not "computerish" in appearance. I wanted to create fonts in which I could control every pixel, and make the letters look more like those you would see on an ordinary television display.

During my search I discovered an ad for "Doodler." It cost $79.95 and boasted of having the ability to make your own fonts of letters. I sent a check to Paul F. Herman Inc.; within a few days, I received my software.

Doodler was clever and had a lot of features, but I found that it wasn't really useful for photography. Its menus stayed on the screen all the time, as did a dot in

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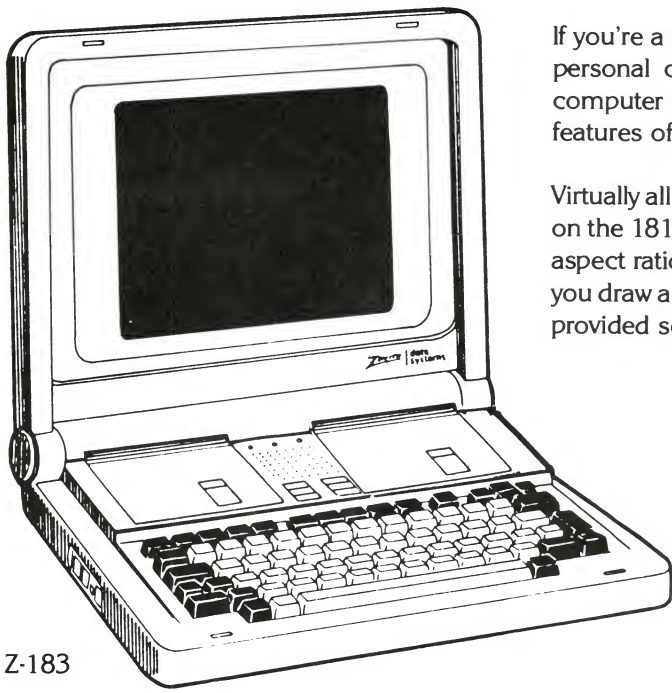

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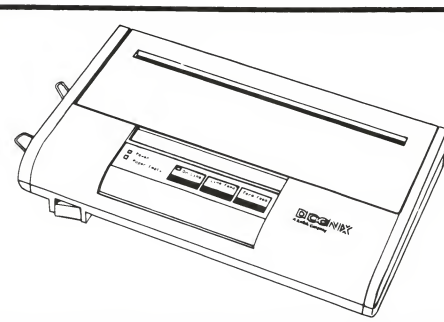

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the middle of the screen. The name was well chosen—it was good for doodling, but not for much of anything else. It appeared to be a solution looking for a problem. (Doodler was reviewed by Marilyn Harper in *Sextant* #17, July-August 1985. See "Affordable Graphics for the Z100." William N. Locke also reviewed Doodler in the "Z100 Notebook" in issue #27, March-April 1987.)

Just about the time I was going to give up on it, I received a flyer from Paul Herman announcing an improved version of his program. It was called "Doodler-V," and cost $99. Those of us with the older program could upgrade for $29.95. I sent him another check and hoped for the best.

Doodler-V

The new Doodler-V is a well designed package with good documentation. The introduction says "you can draw pictures, charts, graphs, plans, diagrams, and just about anything else imaginable that will fit on a computer screen."

The reference section is complete and about as clear as any documentation I have seen. Doodler-V can actually be used from the menu on the 25th line without referring to the manual. The various menu items are selected using the function keys.

As advertised, Doodler-V lets you use fonts included with the program, and it lets you create your own. You can then scale up the font to as much as nine times its original height. Seven pixels is probably as small as you'll want a character, so the font could be scaled to as big as 63 pixels high. In addition, a font can be displayed normally, or as italics (slanted to the right), or backslanted (slanted to the left).

The fonts included with the software are named such that the height in pixels is indicated in the name. For example, 24OUTLIN is a font of outlined characters 24 pixels high.

A quick look at using Doodler-V

The CREATE program included in the software allows you to create your own font of letters, pixel by pixel, on an enlarged grid. I tried it, and within an hour I was making my own font of large letters (24 by 18 pixels) that looked quite acceptable.

Doodler-V has two modes of operation: "screen" and "play." The play mode stores the keystrokes you make in creating a picture; then you re-play them in a sort of "live-action" drawing operation. One of its advantages is that it can save a full screen in less disk space than the actual pixel representation would take. Although the play mode is interesting, I could think of no practical use for it for my own needs.

The screen mode appeared to be best for making color slide titles. In addition to letters of various sizes, any combination of lines, boxes, circles, and other shapes can be included in the picture. When completed, the picture can be saved on disk.

One useful feature allows title slides to be made in vertical format if desired. Just make the title in the normal fashion; then the program's "Rotate" function can turn it 90 degrees. This feature is really terrific when you need a vertical title slide to superimpose on a vertical picture in a multi-media presentation.

The software has many other features that I have not fully explored because I don't really need them for my title slide application. (If you want more details on the actual operation of Doodler-V, you might want to take a look at the reviews mentioned above.)

By the way, the same version of Doodler-V runs both on the Z100 and on IBM-compatible machines; so, those of you who work with both types of machines can create picture files on one and display them on the other.

Problems

Was anything wrong with Doodler-V? Several things.

The only colors available in the IBM-compatible version were cyan, magenta, and white. The background could be one of these colors, or black.

A title slide with magenta letters on a cyan background just doesn't hack it. No matter what combination of colors I chose, the slides looked washed out.

The most aggravating thing was the one-pixel dot right in the middle of the screen—it could not be turned off. Also, there was no way to turn off the menu on the 25th line. I could live with the 25th line by cropping it out of the slide, but that ever-present dot in the middle of the screen was another story. The only way around it was to make sure that a letter in the title was the same color as the dot, and was situated over it.

Solutions

When all else fails, read the documentation!

One day, I found a BASIC routine in the appendices section of the Doodler-V reference manual; the routine was designed for integrating Doodler pictures into BASIC programs. I keyed in the routine and tried it. It did not work.

After much study, I found that two lines contained errors. After I made the corrections, it worked fine. It took about five minutes for the program to draw each picture on the screen pixel by pixel, but when it was finally done there was no 25th line and no dot in the middle of the screen.

The BASIC program also allowed me to use the red-green-yellow palette (Palette 0) instead of the magenta-cyan-white palette (Palette 1); and it gave me the choice of eight background colors. (The GW-BASIC manual indicates that Palette 0 is red, green, and brown. It may be brown to them, but it looks more like yellow on every monitor I have seen.)

I finally had a means to make good title slides—even though it took five minutes for BASIC to draw each one. It took at least two hours for a 24-exposure roll of slides. There still had to be a better way.

Better solutions

I thought about writing a letter to Paul Herman, but I was sure I would get little or no response because my problem was unique to a specific application. Then I received a newsletter from him containing application ideas, corrections for bugs found in the software, and additional information. Much to my chagrin, the

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newsletter contained the correction for the bug I had found in the BASIC program. Here was a company that gave service after the sale!

Encouraged by the quality of the newsletter, I wrote the letter and sent along a sample color slide. Within a few days, I received a disk and a personal reply, two pages long, from Paul Herman. He enclosed a disk (Version 5.03), and pointed out that it included a feature for turning off the 25th line and eliminating the dot in the middle of the screen. Apparently several other users had contacted him about the same problem. Now you just hit a function key and the dot and the line disappear.

In addition, he included the source listing for a simple assembly-language program that lets you create a colored background and change the color palette from 1 (magenta, cyan, white) to 0 (red, green, yellow) before entering Doodler-V. He outlined how to use DEBUG to create the program. Even though I had never used DEBUG before for this purpose, his step-by-step instructions made it easy. That kind of software support rates a "10" in my book.

Automatic setup

Doodler-V now does everything I need to produce attention-getting title slides. In fact, I often get more comments on my titles than I do on my pictures. I can texturize, fill in areas with color, move the images, make shadow edges for the lettering, and do a dozen other things. The creative possibilities are endless.

Before I call Doodler-V, I load one of three versions I've made of the assembly language program. One version creates a blue background and sets the color palette to 0 (red, green, yellow). The second version creates a black background and sets the color palette to 0. The third creates a blue background and sets the palette to 1. This is used to create white letters on a blue background.

Using a setup program to change background colors and palettes is a little inconvenient; if you want to change the background from one color to another, you have to exit Doodler-V, load the other program, and re-enter the Doodler-V program. Possibly some future version will include automatic switching as an option. I still have not figured out a way to have black letters on a blue background.

Positioning the camera

Photographing the monitor screen is not difficult. A 35-millimeter single lens reflex camera is best for this purpose, because you can accurately frame and focus through the lens.

The essential thing is to have the camera in perfect alignment with the monitor: the film plane of the camera should be parallel with the face of the monitor, and the center of the camera's

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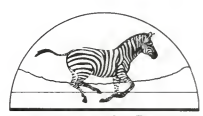

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viewfinder should be in line with the center of the monitor screen.

Many people put the camera on a tripod when photographing the monitor. I found it very difficult to get good alignment and the correct magnification using a tripod. Instead, I placed the monitor on a table; using a sturdy wooden box or a stack of large books, I then raised the camera until the center of the lens was the same distance from the table top as the center of the monitor.

To make the task even easier, I fabricated a plywood device that has an 18″ by 40″ baseboard. The color monitor is held in place on one end of the baseboard with quarter-round molding. The camera holder is on the other end. It can be slid toward and away from the monitor on two 1″ by 4″ wood guides.

The camera is mounted at the correct height to allow it to view the center of the monitor; it is restricted from shifting right or left by small pieces of molding fastened to the camera holder. This keeps the film plane parallel with the screen at all times.

Exposure, etc.

To eliminate reflection from the face of the monitor, the room must be completely darkened when taking pictures of the screen. It is advisable that you wear dark clothing rather than white so that light from the monitor is not reflected back onto the face of the screen.

It is best to use a long exposure time, because with a long exposure a small aperture can be used. This increases the depth of field, making focusing less critical.

The camera should have a lens with a focal length of at least 55mm. When you photograph a relatively flat subject such as a monitor screen, using a wide-angle lens (such as a 28mm or 35mm) tends to distort the image near the edges. However, a typical 55mm lens will not focus close enough to fill the whole frame with a 13″ monitor screen. This can be corrected by adding a close-up lens (+1 or +2) to the front of the camera lens.

Photographing a typical monitor at a shutter speed of one second with Ektachrome 64 or Kodachrome 64 slide film, the exposure is approximately f11. After I found the f stop that gave the best exposure, I taped my monitor's intensity control in place; this way, the exposure could always be the same.

In any case, the shutter speed should be 1/30 of a second or slower in order to completely capture the image on the screen. At faster shutter speeds, there may be gaps in parts of the picture because of the monitor's scan rate. I doubt that automatic exposure control will produce good exposures in this situation.

Curvature and cutting

Depending on the flatness of the monitor screen, and the flatness of field of the camera lens, vertical or horizontal lines near the edge of the picture may appear to curve. When you create the title slide, it is best to avoid using lines near the edge. How much of the screen can be used without objectionable distortion will have to be determined experimentally.

If every exposure on the roll is a title slide with a black background, the photofinisher might not cut the frames apart at the correct place when putting them in their mounts. To overcome this, I photograph one image at each end of the roll against a colored background; the photofinisher can then see where the frame line is supposed to be. After the colored slide, there should be a frame line every eight perforations.

Enjoy

Making title slides with the computer is not only a good application for the computer's color graphics—it can also be an enjoyable creative process.

If this were a slide presentation, at this point I would show a title slide with the computer-generated words THE END.

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The Eight-Bit World

Walter J. Janowski

Echelon, Inc.

Flicker-Free Kit

20 megs on an H89

HDOS 3 revisited—compatibility

It's a funny thing. Everybody keeps saying eight-bit machines are dead. But every month I still seem to be coming across *new* products for the H8 and H89. This issue, I'll be taking a look at a few of these, as well as delving a little deeper into HDOS 3.

Echelon, Inc.

The new catalogue from Echelon arrived the other day, and it's obvious that this company will be a guiding light in the future of our eight-bit machines.

The folks at Echelon take issue with a point of which I myself am guilty. I usually refer to the family of Heath/Zenith machines consisting of the H8 and H89 (and maybe, grudgingly, the H/Z100s) as "eight-bit machines." But Echelon rightly points out that the largest selling computers today are indeed eight-bit machines also. The IBM Personal Computer and its clones are built around the Intel 8088 microprocessor—which sports an *eight-bit* data bus. Echelon doesn't want computers built around Zilog's Z80 or Hitachi's HD64180 microprocessor to be lumped together with the IBM PC. So, Echelon instead refers to "CP/M-compatible" machines.

I have to admit I completely agree with their reasoning. Unfortunately, I've been referring to the '8 and '89 as "eight-bit machines" for so long, I don't think there's any real point in trying to change now. But their point is well taken, and it's certainly worth keeping in mind.

Anyway, Echelon markets ZCPR3, the replacement for Digital Research's standard console command processor (CCP) in CP/M. They also offer ZRDOS, a replacement for CP/M's basic disk operating system (BDOS). Together, ZCPR3 and ZRDOS form Z-System. Install it along with the Heath version of CP/M's basic input/output system (BIOS), and you could say that you've finally gotten Digital Research out of your system.

ZCPR3 is "freeware": it's copyrighted, but they allow free non-commercial distribution. The source code is available on a number of bulletin boards. The full system is huge, though, going to ten disks ($89 from Echelon). Echelon also sells utilities, assemblers, disassemblers, books, and a host of other items all specifically aimed at the "CP/M-compatible" community.

The catalogue itself is more of an educational magazine than a catalogue. All products are described in great detail, and much space is devoted to the concepts behind the ZCPR3/ZRDOS Z-System. Echelon also publishes the *Z-News* newsletter, at $24 per year. *Z-News* is frequently quite terse; one reader I know said that it "could be called arcane." But it features all the latest info and developments for our supposedly obsolete CP/M systems. The newsletter itself is a must-have. Write for the catalogue.

By the way, Analytical Products is authorized to distribute Echelon products to the Heath/Zenith world in our disk formats, and customized for our machines.

Flicker-Free Kit

One of the few annoying habits of the H19 terminal is that pesky flickering you'll notice when graphics or text scrolls rapidly up the screen. And since the H89 incorporates the H19, it has the same problem. The flickering usually shows up as little spots or dashes that flit across the display as it scrolls.

This occurs because two circuits share control of screen memory. The CRT-controller chip on the terminal logic board (TLB) has control most of the time; it loses control, though, when the central processing unit (CPU) needs to write a character to the screen. Then, the CPU sneaks memory away from the controller momentarily—which results in the flicker on the screen. The effect is quite noticeable when running the terminal at the normal 9600-baud rate, and gets even worse if you attempt to increase the speed to 19,200 baud.

However, back at HUGCON 5, I picked up the Flicker-Free Modification Kit from Lee Hart at TMSI. This innocent-looking little pack of eight integrated-circuit (IC) chips claims to put an end to those annoying little dashes, and to provide reliable operation at 19,200 baud.

The kit comes with a 24-page installation manual that at first looks a little intimidating; upon more careful examination, though, it is quite thorough and friendly. The manual is very well laid out, with lots of diagrams, check points, and explanations; it's not unlike the excellent Heath manuals we've all come to depend on.

Installation involves disassembly of your computer (or terminal) and removal of the terminal logic board. Then a few chips are replaced, and some jumpers need to be cut and others installed.

As I said, the manual looked a little intimidating at first glance; so, being pressed for free time, I set the kit aside for a few months. However, when I finally

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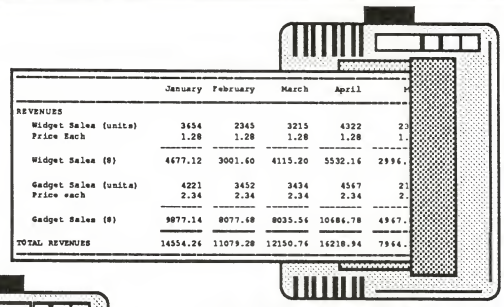

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got around to actually attempting installation, I was pleasantly surprised by how simple the process was.

Two of the ICs replaced are read-only memory (ROM) chips: the character-generator ROM (U473 in '89s, U420 in '89As) and the terminal-logic board ROM (U422 in '89s, U437 in '89As). In the programming they contain, the new ROMs are identical to the Heath originals; but the routines have been copied into complementary metal-oxide semiconductor (CMOS) ROM chips, which are faster and consume less power. (CMOS ROMs are necessary for proper installation. If your machine has a ROM such as the G-Prom, Super-19, etc., that is not standard issue, you can send it to TMSI; they will copy it into a proper CMOS version for $10.)

The rest of the kit consists of four low-power four-kilobit CMOS RAM chips, the address-decoder chip, and a logic chip also in the address-decoder circuit.

Installation of the chips simply requires removing the old one from the TLB and installing its new replacement. Mercifully, Heath socketed most of the ICs in its kits, so this process is quite simple. After you install the chips, there are a few programming jumpers to be changed, which requires a little bit of soldering. However, if you assembled the computer from a kit in the first place, you should have no trouble with the installation.

After installation is complete, the computer (or terminal) is reassembled. Then you plug it in, close your eyes, and turn it on. If you've followed the instructions correctly, there will be no flame and your faithful old buddy won't be heading off to computer heaven in a cloud of smoke. Fortunately, mine gave a few reassuring beeps and came up normally.

The manual provides a set of procedures for testing the modification for proper operation; also, it includes a detailed set of troubleshooting procedures in case of difficulty.

The overall benefits are many. Most obvious is that the dark dashes that caused the original flickering are no longer there. Second, installing CMOS ICs in place of the originals reduces overall power consumption by about 300 milliamps, or about as much as removing an input/output (I/O) board. Third, setting the terminal to run at 19,200 baud noticeably increases the speed of the display; it's particularly fast if your computer has been upgraded to run at 4 megahertz.

The Flicker-Free mod works by using very fast screen memory chips. The Flicker-Free continuously switches memory back and forth between the CPU and the CRT controller, and does so at a clock rate of 3 MHz. When the clock pulse is high, the memory is available to the CPU; it's available to the CRT controller when the clock is low. At the new speed, the display is able to keep up regardless of whatever else is going on.

There may be some compatibility problems if you have made any non-standard modifications to your terminal, such as adding the Graphics Plus mod from Northwest Digital or the previously mentioned replacement ROMs. If you are in doubt about your installation, write to TMSI for info before purchasing.

All in all, the Flicker-Free kit is professionally produced and easy to install. It performs as advertised, and provides a noticeable improvement in operation at a very reasonable price. It's well worth looking into.

The dark dashes that caused the original flickering are no longer there.

20 megs on an H89

Micronics Technology markets a 20-megabyte internal hard-disk drive for the H89 for around $600. With all that storage space, a Winchester always sounded to me like a dream. So when Micronics offered to loan me one of their WIN89 20-meg upgrades for review purposes, I jumped at the chance.

I installed the WIN89 the same day as I did TMSI's Flicker-Free kit. Where the Flicker-Free kit's installation appeared complicated and later proved to be painless, the WIN89 turned out to be just the opposite.

As I browsed through the ten-page installation manual, the modification looked like a piece of cake. Change a few chips, plug in the board and the drive, and you're done. Unfortunately, this did not exactly prove to be the case.

Diagrams are few in the manual, and in some places the instructions are cryptic. Also, installation differs if you have a newer H89A as opposed to an H89. However, the manual does little to explain the differences between the two installation processes.

Before I get too deeply into installation, however, let me first describe the package included with the WIN89. The system is built around an Everex Winchester package designed for an IBM PC or clone. The hard-disk drive itself is a 20-MB Seagate. The WIN89 system includes an interface card that plugs into the '89's left-hand (memory-expansion) bus. A cable from this interface card then plugs into the IBM-type interface card included with the Everex system. One advantage to this approach is that the same system (without the H89 interface) can later be installed in an IBM PC or

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clone (although why anyone with an H89 would ever need one of those machines is beyond me).

Getting back to the installation, we ordinarily don't have to worry about whether we have an '89 or an '89A. After the '89 had been out for a while, the Federal Communications Commission issued rules on the permissible levels of radio-frequency interference (RFI) radiated by home computers. To continue selling the '89, Heath/Zenith had to make certain physical changes to limit its RFI. These changes involved an RFI shield and changes in the layout of components on some boards.

(I think the Micronics interface card for the H89 might be slightly different from the one for the H89A. In any event, it's probably best to specify which one you have.)

These little physical differences have no effect on operations, but they are significant enough to change the way you install the Winchester. According to the manual, the difference in installation between the H89 and the H89A is due to the lack of clearance between the top of the CPU board and the case of the H89. (Apparently, the H89A has greater clearance.)

The installation instructions can be deciphered without too much difficulty; with a reasonable amount of common sense, you should be able to complete installation without any major problems. My main gripe, however, lies in the way the board is intended to be physically mounted.

If you have an H89A, the IBM-PC controller card attaches directly to the H89 interface card; for support, one end of the controller card rests on the CRT grounding strap. While this seems a slightly shaky setup, it is solid compared to the procedure for the standard H89.

In the case of the older H89, the controller card is first inserted into a manila envelope(!). Installed, it rests unsupported alongside the hard-disk drive itself in the internal drive recess. The controller cables are not shortened, so you may later use them in your PC clone. The manual suggests wadding up these cables and using them as insulators to prevent the controller board from contacting the drive itself.

After following the instructions this far, I finally decided to remove the interface board. After studying it for a few minutes, I re-installed it more practically—using rubber bands to keep the cables in line. While operation has been without problems since installation, even this better method seems completely unacceptable in any system where the computer might be occasionally moved from place to place. A few long screws and spacers ought to be all you'd need to establish a more secure mounting—something like that should be included with the kit.

Two disks of CP/M software are included with the WIN89. One is a set of files and utilities necessary to install and use the Winchester; the other contains ZCPR2, the public domain replacement for CP/M's CCP.

The Winchester-utilities disk includes formatting, directory, and surface-fix (bad-sector-lockout) programs, many of which come with the source code. It also includes a modified BIOS that recognizes the hard drive.

In order to produce a bootable disk that will recognize the hard disk, you'll need to be familiar with CP/M installation and the MAKEBIOS procedure. The MAKEBIOS procedure is notorious for being complicated, but following Heath's CP/M manual step by step, I got through it without messing anything up.

After a new system is created, running the Micronics program HINSTALL.COM will place the operating system onto the Winchester, allowing you to boot from the hard drive. One of the ICs changed in the installation procedure is the boot ROM. The Micronics ROM offers you the option at power-up to boot either from a floppy drive or from the Winchester.

The second disk contains all the files necessary to install ZCPR2, version 2 of the public domain replacement for CP/M's CCP. ZCPR2 offers improvements particularly applicable to a hard-drive environ-

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ment; in particular, ZCPR2 gives you simpler methods of moving between different drives and user areas. Also, ZCPR2's PATH function allows you to place commonly accessed programs in the A0: user area, where they may be accessed regardless of which user area you currently reside in.

After I installed the modified BIOS supplied with the system, everything at first appeared to work fine. However, I found that when I booted from the hard disk, my system could not access the floppy-disk drives. When I contacted Darrell Pelan at Micronics, he informed me that a new version of the BIOS would correct the problem and that it was available from his bulletin board.

After downloading the new BIOS and installing it, I found that the system would not boot at all! Before I had a chance to investigate further, however, I received a call from Darrell apologizing, and informing me that the correct BIOS was now available on his bulletin board. After I downloaded this newest BIOS, the system performed correctly.

When you boot from the hard disk, the time it takes to boot is next to unnoticeable. Disk-access time is considerably faster than that of a floppy, and it just plain feels good to call up a directory and find 7,726 kilobytes of free space. Micronics provides the hard drive partitioned into three logical drives (A:, B:, and C: if you've booted from the Winchester). Two of them are 8-MB drives and one is 4 MB.

The only unfortunate feature of a Winchester drive is that a small file can use up a lot of disk space. This is due to the way CP/M allocates disk space to files.

Under CP/M, a disk is divided into blocks. The block size in a soft-sectored floppy is 16 records (128 bytes each); therefore, a file is allocated disk space in 2K blocks. Even a one-byte file uses up 2K of disk space. That allocation increases with the storage capacity of the disk: it can go up to 4, 8, or even 16K. With my Winchester, the minimum allocation is increased to 8K on drives A: and B:. Minimum file allocation on the smaller drive C: is 4K. (STAT DSK: will show records per block for all logged-on disks.)

The WIN89 performs reliably, and is priced more reasonably than other systems.

Alas, the WIN89 does not support HDOS. Many of my favorite HDOS programs (particularly the notoriously disk-bound Home Finance System from Jay Gold) would benefit greatly from a hard drive. Micronics claims it will add HDOS support if demand warrants.

It may be a small complaint, but I feel that the newer version of ZCPR, ZCPR3, should be included with the system. When installed with the ZRDOS BDOS replacement, ZCPR3 lets you give names to CP/M's user areas and use them as subdirectories, similar to MS-DOS. ZCPR3 would be particularly useful in a hard-disk environment.

I may seem to be a little harsh in my criticism of the WIN89, and I don't really wish to be. The system performs reliably, and is priced very reasonably compared to some similar Winchester systems. But you should make sure it fits your particular needs before you buy it. If you don't have need for HDOS support and your computer moves infrequently enough to ignore the insecure mounting, the WIN89 might be a worthwhile investment.

HDOS 3 revisited—compatibility

Well, I've continued to explore HDOS 3, and I'd like to take a little time to touch on its compatibility with earlier versions of HDOS.

Before I go any further, let me point out something about my system that might affect the validity of my findings. HDOS 3 arrived just about the time I switched over to 96-track-per-inch drives, so my new HDOS system disks were all created on 96-t.p.i. drives. How-

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ever, all my existing HDOS software from earlier versions is on 48-t.p.i. disks.

In HDOS 3, the INIT program creates a slightly different directory structure than earlier versions did. The documentation warns that earlier versions of HDOS will not be able to read disks INITed under version 3.

However, I found the opposite to be the case. I was unable to read older disks with version 3, but I was able to read and write to version 3 disks using version 2. Transferring my software to the newer disks involved first INITing disks under HDOS 3, then booting HDOS 2 and copying the programs to the version 3 disks. Then, after rebooting under HDOS 3, I was able to read the files on these disks.

The folks at *Sextant*, though, had a somewhat different experience with their 8″ drives and hard-sectored 5¼″ drives. HDOS 2 could mount but couldn't CATalog or read any of the hard-sectored 5¼″ HDOS 3 disks as they were received from Bill Parrott.

Later, however, they INITed new disks under HDOS 3 on their H8 (which has no clock). Then HDOS 2 could mount and CATalog those disks with no problems. It could read the 8″ files and some of the 5¼″ files. It reported that it couldn't find some files on the 5¼″ disks, even though they showed up in the directory.

(The inconsistency appears to be related to the time stamp that Bill included in HDOS 3. Create a file in a computer with no clock, and a CAT will show that it has been assigned a time of 12:00 midnight (00:00). HDOS 2 is then able to read it. But if a version 3 file has any other time, HDOS 2 will report that it can't be found.)

The documentation also warns that software that messes with the operating system itself might not run under version 3—particularly if the software author did not follow standard programming guidelines.

Unfortunately, the one HDOS program I use most twiddles with the operating system considerably. Jay Gold's Home Finance System modifies HDOS during the installation procedure to provide auto-boot capabilities, and to patch out some of the messages that the operating system might ordinarily send to the screen.

Needless to say, Home Finance System will not run at all under HDOS 3. At boot time, the error message "Wrong Version of HDOS" is understandably displayed. I realize there may not be excessive demand for it (the HDOS version isn't even available anymore), but perhaps Dr. Gold might consider an update for us HDOS die-hards as a labor of love? (Hint, hint.)

My favorite editor, PIE from The Software Toolworks, runs reliably under HDOS 3, but the free-memory indicator shows that it does not seem to take advantage of the 3K-4K of extra memory freed up in version 3.

Some games behave somewhat erratically under 3. This isn't surprising; during installation, some of them do a few modifications to Microsoft BASIC and the auto-boot routines. However, this problem may be correctable. I'll be investigating further and reporting in the future.

Aside from these few, every other HDOS program I've tested seems to run normally under version 3 so far. I have heard rumors that one or two of the commercial telecommunications software packages for HDOS misbehave, but I've not been able to verify any of these personally.

Coming up next

For those who complain that there is no new software for CP/M, next time I'll be reviewing Rembrandt, a business graphics (!) package for the H19 terminal. Those MS-DOSers who insist the H8/H89 cannot produce graphics will be eating their words. See you then.

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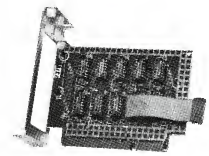

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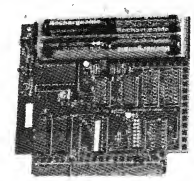

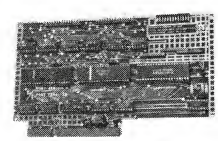

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Not Another '100 Key Click Program (!)

How many software engineers does it take to silence the keyboard of a Z100? None—it's a hardware problem. Here are three solutions.

R. John Davis

Another key-click program! How many times have we heard that? For a while there, it was all we heard about. Well, I don't know about you, but I got tired of them.

There was the program you assembled and stored on disk. There was the ASCII string you embedded in the operating system's sign-on message. And there were even patches to Peachtext 5000 or WordStar.

Depending on which version of PeachText, or WordStar, or Lotus 1-2-3, etc., that you had, these marvelous programs might or might not have worked. If they didn't, you then had to search for some other method of disabling this sometimes annoying feature of the Z100.

Don't get me wrong. There are, I'll admit, people who are not annoyed by, and may even prefer, the chirping of the keyboard as they type along. But there are occasions when the key click isn't a good thing. If you live in a house where you have to use your computer at all hours, and the computer is not isolated from the rest of the house, this sound can carry throughout the area and awaken sleepers. Another problem is that the sounds can be a source of irritation if you have sensitive hearing, or if you are in an area where the sounds bounce off the walls.

I could go on and on about the whys of disabling the key click; but, then, I already have. So, to get to the point of this article, read on.

This time, instead of yet another program, you have a hardware alternative. I'll give three options, actually, but they all boil down to the same idea: open the noise-producing circuit somewhere. (Two of the options employ a switch so you can close it again.)

R. John Davis was introduced to the Z100 through the U.S. Air Force, where he is employed as a project engineer. He uses the '100 for "just about everything" at work.

A word of caution

The instructions I'll give here are greatly simplified; they assume that you know how to disassemble and reassemble your computer. Also, you should have the owners' Technical Manual designated "Hardware," which gives you pictorials of the circuit board and instructions on disassembling and reassembling the computer.

If you don't have the manual, or if you are not experienced at this sort of work, I would not recommend that you try this on your own. You would do better to refer this task to someone who knows how to do it and can guarantee the work; otherwise, you could end up with an unusable computer.

The best method is disabling the output of the one-shot multivibrator U218A.

Kill the beep, too?

Of the three methods that will disable the key click, the first and simplest method is to disable the speaker (X101). Figure 1 shows a diagram of the circuitry around U231, the chip that drives the speaker when pulses are received from the "beep" and the key-click circuits. (You can also see this on Sheet 4 of 4 of your Z100 main-board schematics.) The speaker can be disabled by inserting a switch in series with R117. (See Option 1 in Figure 1.)

On my unit, R117 was just a jumper wire; no resistor was installed. If that's the case with your Z100, the wire can be removed and connections can then be made to the pads. Or you can cut the wire in the middle, and use the ends to make your connections.

In the event that your computer has a resistor in the R117 position, it will have to remain in the circuit. Remove one end of R117, and connect a wire to it. Connect another wire to the pad from which R117 was removed. These two wires can then be run to a switch that you can mount, preferably, at the rear of the computer. Then, when you want the click disabled, you merely throw the switch to the OFF position.

The only problem with this approach is that turning off the key click also disables the beep. The beep does have a definite usefulness. On bootup, it lets you know if a problem exists in the system. Thus, you need to have the beep when you boot. Using this approach requires that you remember to throw the switch to the ON position before you boot. Also, the beep is used in some software to warn you of errors.

Disabling just the click

The second, and preferable, method is to disable the output of the one-shot multivibrator U218A. This section of chip U218 provides the pulse that makes things go click; as noted above, it sends its output to U231, which actually drives the speaker.

To install the disable switch, perform the following:

1. Find U218 and U231 on the *main* circuit board.
2. With an X-Acto knife or razor blade, cut the printed-circuit trace that goes between U218 pin 6 and U231 pin 2. This trace is located on the top of the board.
3. Mount a good-quality single-pole/double-throw switch in a convenient place. I mounted this in one of the unused connector slots in the backplate.
4. Run a wire from U231 pin 2 to the center, or slider, connection of the switch.
5. Run a wire from U218 pin 6 to the position of the switch you would like designated as "key click on."
6. Run a wire from a ground on the main board. (U231 pin 4 is a convenient

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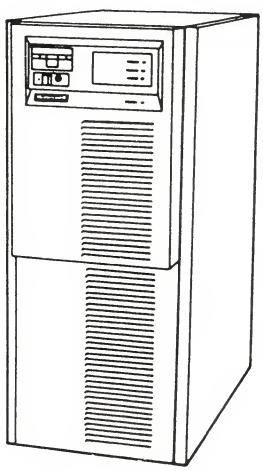

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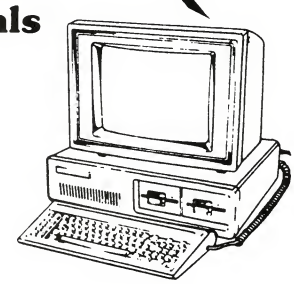

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place.) This wire will go to the position of the switch you would like designated as "key click off."

The resulting circuit should look like Option 2 in Figure 1.

Third alternative

There is another way to disable the key click, without installing a switch.

Simply remove chip U218 from its socket, bend pin 6 out and up, and reinsert the chip. Next, make a jumper that will reach from pin 2 of U231 to pin 4 (ground). Small solid wire, AWG 24 to 28, will do. Insert this jumper into the pin sockets—making sure, in the process, not to short pin 3 to either of the mentioned pins. It's a good idea to check this with an ohmmeter to be sure you have good connections and no shorts.

Maybe a combination

I installed both the first and third alternatives. First, it's easy to reverse the effect of either one; second, the key click is completely removed, and the beep becomes optional. You can disable it if you don't want your spouse to know you're up in the night doing "just one more revision" to that great program you've been writing.

Reassemble the computer and check the operation of the switch. If all is well, you can now go back to using your Z100—quietly. △

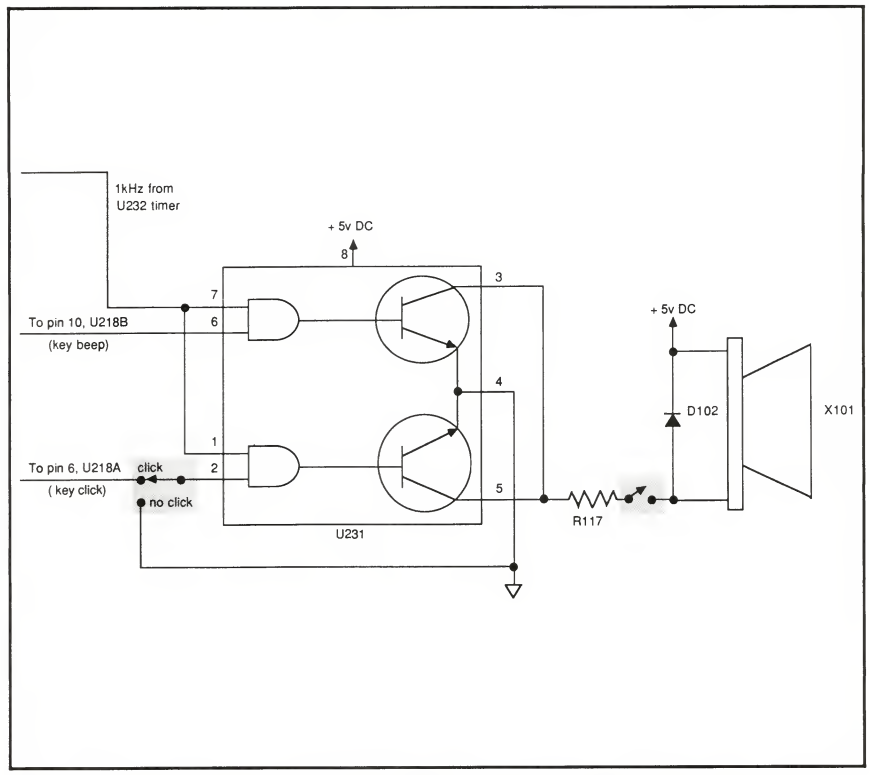

Figure 1. Schematic diagram of the Z100's speaker circuitry. Two options for disabling the key click are shaded. Option 1 (inserting a switch in series with R117) is simple, but it also disables the beep. Option 2 (inserting a switch between U218A and U231) lets you turn off the key click without affecting the beep. A third option—described in the text—involves bending a pin and inserting a jumper into two pin sockets.

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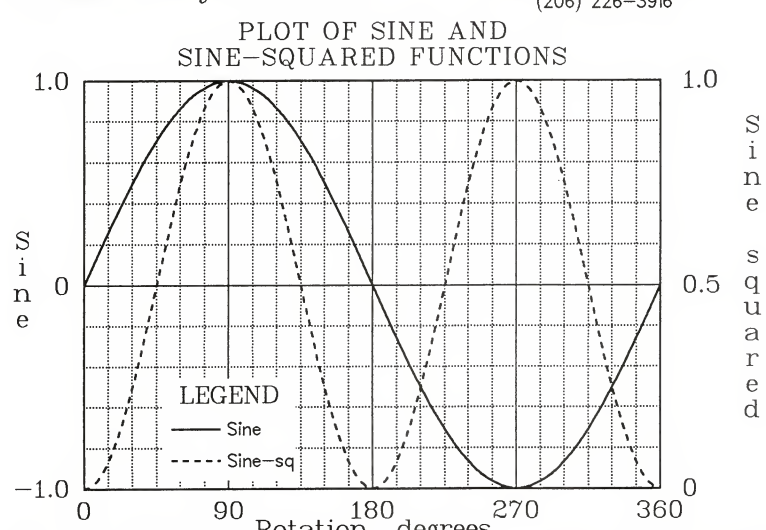

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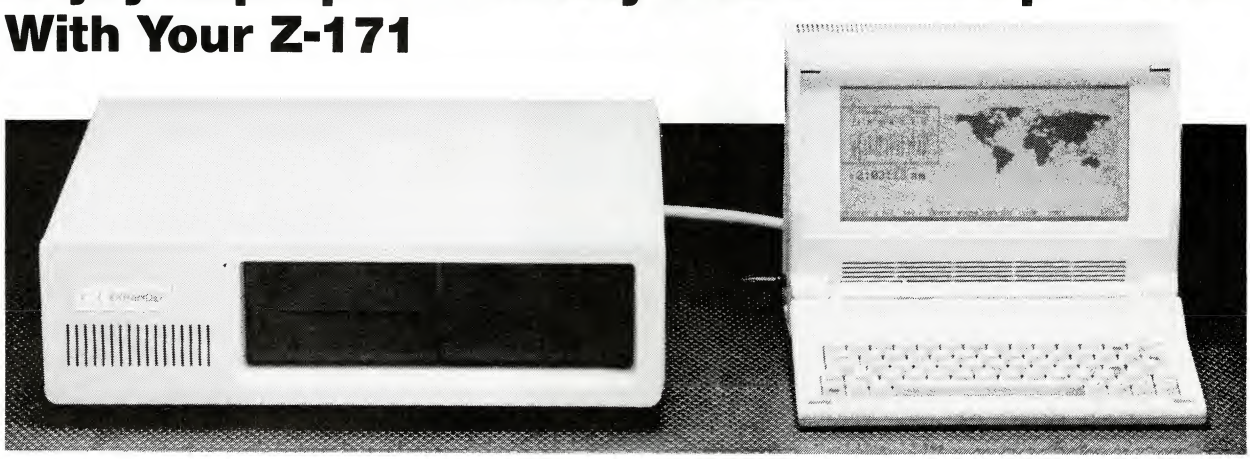

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The '148: All the Essentials for IBM Compatibility

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Wayne Rash, Jr.

It's small, it's inexpensive, and it doesn't get a lot of attention. That's too bad, because Heath/Zenith's H/Z148 is an eminently practical machine—one of the best choices available for people who need to run software written for the IBM Personal Computer.

The H/Z148 is designed as a minimal computer. It includes as standard equipment those items most people want, but allows for very little to be added later. You limit your choices, but in return you save money on the basic package. (For some background on the history of the '148, see "New Life for the Z150 from Gate Arrays" by James C. Kunze, in *Sextant* #24, September-October 1986.)

Photo courtesy of Zenith Data Systems

What you get

Because the H/Z148 was designed to support more or less simple operations, you get the basic necessary equipment, but few frills. Until recently, for instance, this machine was not available from the factory with a hard-disk drive. You had to choose either one or two floppy-disk drives.

Doing without frills, though, doesn't mean doing without quality. For example, you get the same keyboard that's included on the H/Z150-series computers.

The designers of this machine obviously realized that most users need to print and to communicate. For that reason, the H/Z148 includes both a parallel port for a printer, and a serial input/output (I/O) port, most often used with a modem. You can choose a color or monochrome monitor, since provisions for both types are made in the '148.

Wayne Rash, Jr., is a frequent contributor to Sextant *and other computer magazines. He is also a consultant with American Management Systems in Virginia.*

The designers also intended that the machine would not be a slouch when it came to processing speed. The '148 will run either at the IBM PC's standard 4.77 megahertz, or at 8 MHz. The components in the '148 are fast enough to keep up with the higher speed. There's no need for wait states, which let the central processing unit (CPU) pause to accommodate slow components elsewhere in the machine. Running without wait states makes the '148 much faster than most other IBM-PC clones, including Zenith's '158. The speed can be switched by pressing a push-button on the front of the machine.

What you don't get

In a word, expandability. In its standard configuration, the H/Z148 has no expansion slots; you can, though, buy a daughter board from Zenith. My experience is with the Z141 board, which provides you with a slot that can accept one accessory board. This has been replaced in the Heath catalogue by the ZA-148-2, which lets you have two slots. You can also buy a daughter board with two slots from Premier Technologies. If that's not enough, you can get an external expansion box from UCI Corporation; it adds six full-size and two half-size slots.

Of course, virtually all commonly needed options, such as graphics, communications ability, etc., are included as standard on the '148; so a lot of expandability would not really be required by most people.

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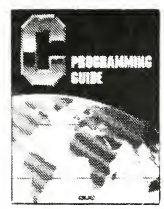

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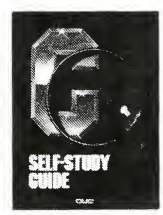

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popular expansion options. The machine comes standard with 256 kilobytes of random-access memory (RAM). This can be expanded to 640K simply by plugging in more chips; there's no need to install additional circuit boards. The '148 includes a socket for an 8087 math co-processor, and a 20-megabyte hard disk is now available as an option.

Using the '148

If you've used other Heath/Zenith IBM-PC clones in the past, the H/Z148 will seem quite familiar to you. With the exception of having the higher speed option, the machine is quite compatible with other IBM-PC-compatible computers. During the course of this review, I found no software that was unable to run properly.

Of course, there could be problems running some programs. Games, for example, are frequently speed-sensitive, or include extremely hardware-specific code. Similarly, some copy-protection schemes are notorious for looking for obscure details deep in hardware. If any problems occur, they will be most likely to show up in these areas.

As I noted, the keyboard is the same one used on the '148's larger sibling, the H/Z150 series. This is an excellent keyboard that avoids some of the IBM's peculiar key locations. In addition, there are light-emitting diodes (LEDs) in the Caps Lock and Num Lck keys, so you can tell when they are toggled. As with the Z150, these lights are activated only when the keys are pressed. If the keys are activated by software, the indicator lights will not tell you so.

The keyboard plugs into a socket in the front of the computer. This means that you don't have to stretch the keyboard cable around the back of the machine; there's more length for your use.

The machine is quiet and unobtrusive. While it does have a fan, it takes relatively little air to cool the 63-watt power supply, and little noise results. Likewise, the floppy-disk drives on the review machine were fairly quiet, although this seems to vary quite a bit among machines. The disk drives on some Z148s that I have used have been noisy.

The H/Z148 will support a composite monochrome monitor or a red-green-blue (RGB) color monitor. Plugs for both of these are on the rear of the machine. Zenith has announced that the '148 will be able to support Hercules graphics or enhanced graphics in the future. Current H/Z148s allow the installation of an additional video card via the daughter board, although you must change the setting of a switch on the I/O board if you do this.

A look inside

If you decide to install an additional card, an 8087, or more memory chips, you'll find that getting into the '148 is quite straightforward. You open the plastic-cased H/Z148 by removing two screws at the rear of the computer. This allows you to lift the rear of the top cover and slide it back, exposing the disk drives and the I/O board. The disk drives are covered with a metal shield to help prevent radio-frequency interference.

(In the H/Z148's design, the motherboard has been separated into two boards: the I/O board is called the rear motherboard; the front motherboard is the CPU board.)

The rear motherboard handles the I/O tasks for the '148, and provides the physical support for the expansion board. On this board are the disk controller, the serial and parallel ports, and the plugs for the monitor. The rear board is attached to the front motherboard by a ribbon cable.

Before you can really see the front motherboard, though, you have to get the disk drives out of the way.

Disk-drive extraction

The H/Z148's disk drives are mounted on a sub-chassis, which in turn is mounted to the case. You simply remove the entire sub-chassis if you need access to the CPU board.

To do this, you first have to remove two screws holding the sub-chassis in place. Once this is done, you have to depress two plastic "keepers" in order to allow the drive sub-chassis to slide to the rear. (If you press too hard, you will break these off. I was never able to determine the proper amount of pressure, and the keepers in the review machine are missing as a result.)

The motherboard exposed

Now that you have the disk drives out of the computer, the H/Z148's motherboard lies exposed before you. At this point, you are in a position to upgrade the machine, or to add an expansion card. Memory and co-processor upgrades require only that the appropriate integrated-circuit chips be plugged in.

If you want to add an expansion board, however, you still have more to do. At the rear, you must add the daughter board, which includes the expansion slot. The Zenith daughter board comes with a couple of small plastic pieces that go at the front of the computer and are used to physically support the actual expansion card.

Expansion cards

Most people add an expansion card to their computer to allow more memory, or so that they can have communications ports or a video card. The H/Z148 already provides for color and for an external modem, and as a result there is relatively little need to add an expansion card.

Two common add-ons are network cards and hard-disk controller cards. Not all add-on cards will work, though. Some controllers with attached hard disks, and memory cards with "piggyback" boards, are too big to fit in the cramped area beneath the '148's disk drives.

During the course of this review, I had

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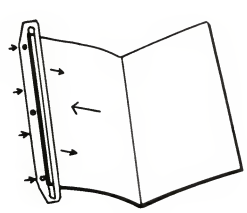

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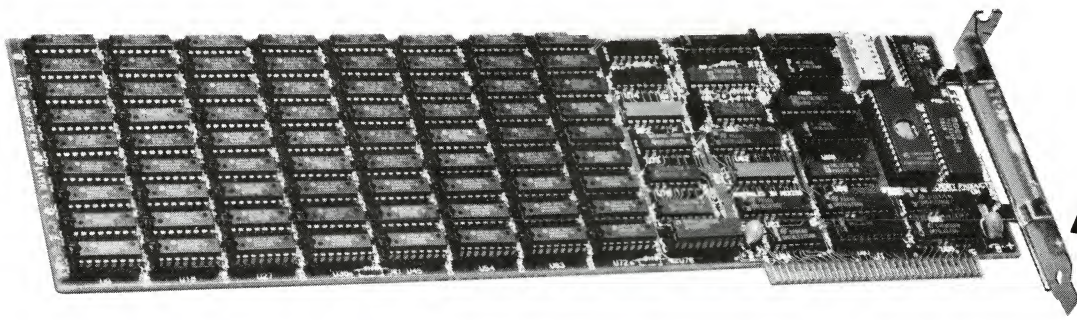

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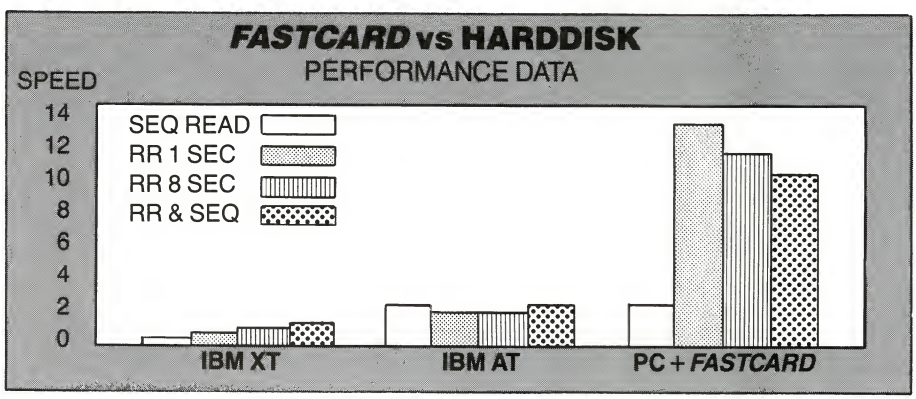

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occasion to try the Zenith daughter board with a JRAM 2 memory board from Tall Tree Systems. The Zenith board worked fine; the JRAM 2 board did likewise at 4.77 MHz, but it was not able to operate when the '148 was running at 8 MHz. It is fairly common for memory-expansion cards to be unable to operate at 8 MHz, but other cards do not seem to be affected by the high speed of the H/Z148.

The Zenith daughter board is not the only method of expanding the H/Z148. As I mentioned earlier, a similar daughter board is available from Premier Technologies. This board will allow a full-sized card and a half-sized card to be added to the '148. In addition, the Premier Technologies product includes a battery-operated system clock.

The UCI expansion box mentioned above comes with its own power supply and fan. Besides providing expansion slots, it includes brackets for mounting two full-height or four half-height drives.

Unfortunately, I was not able to test either the UCI expansion box or the Premier version of the daughter board for this review.

Documentation

The Z148 delivered to me for this review came with documentation in loose-leaf binding. It is clearly written and illustrated where necessary. The manual follows the Heath/Zenith practice of including information that's useful to all levels of users. New users will find that the beginning sections of each topic are understandable, while advanced users will find the detailed explanations that they need.

The '148 comes with the current version of the Microsoft Disk Operating System (MS-DOS) and an accompanying manual; the review unit came with MS-DOS 3.1. As with the hardware manual, the explanations are aimed at all levels of users. This results in a manual that's longer than MS-DOS manuals from other computer manufacturers, but it's a lot more usable.

Conclusions

The H/Z148 is probably the ideal computer for the user who views computers simply as tools. It performs virtually every function required of an IBM-PC clone, it's small, and it's fast.

The H/Z148 is also easy to buy: it's inexpensive at $1,495 for the assembled version. Heath/Zenith Computers & Electronics centers have been selling the kit version with a hard disk for $1,295. In its most basic form—a single-drive kit version—the '148 can be purchased for less than a thousand dollars, an excellent price by any standard. Even novices can feel comfortable about buying a kit version—it requires no soldering, and can be completed in an evening.

Hobbyists will likely be unhappy with the limited expansion capability of the '148. If you plan to add circuit boards and other hardware, this may not be the proper machine for you. There simply isn't a lot of room inside this machine.

The H/Z148 should be popular with businesses, however. With its small size and excellent keyboard, it provides an ideal word processing work station. For those who are hooked up to mainframes, it's inexpensive enough to be considered an alternative to a terminal. It would be equally economical to use as a station on a network.

Altogether, this is a machine that can be a valuable asset to the business community. And the availability of the hard disk and the video options add to its value both for business and home users.

Ordering Information

H/Z148, assembled, $1,495; kit, $899.
ZA-148-2 Expansion Board, $99.
Heath Company
Benton Harbor, MI 49022
Orders: 800/253-0570; in Michigan and Alaska, 616/982-3411

PTZ148X daughter board, $139.
Premier Technologies, Inc.
1890 McGaw Avenue
Irvine, CA 92714
714/261-1184

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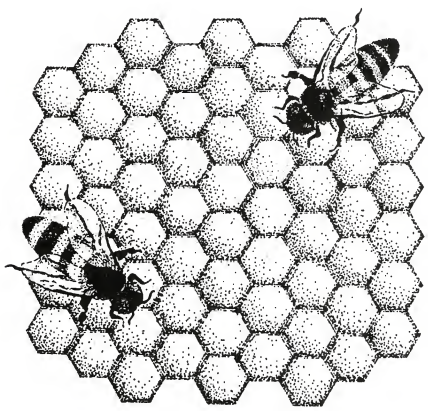

Z-100 users who are ready for PC compatibility, should keep one thing in mind. The future. New, state-of-the-art PC software is creating ever greater performance demands on computer hardware. Large scale, memory intensive programs for networking, graphics, number crunching and communications are quickly becoming the rule, not the exception. But software is only as good as the system that runs it.

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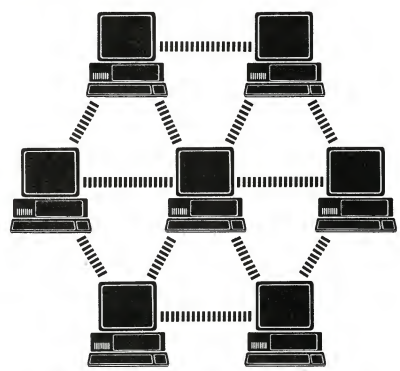

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Z100 Notebook

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I have heard some rather depressing comments of late about microcomputers. Stuff like: "The Golden Age of computers is over," and "IBM has choked the microcomputer industry." One person told me that the computer revolution is dead. Well, I don't agree.

Certainly, the computer revolution is different than it was in 1977. I can now put a major piece of computing equipment in my house and use it to write letters to a relative. That may seem like hitting a tack with a sledgehammer; but, after all, I can buy the thing for less than the cost of a good typewriter. My children can play and play using Doodler and a mouse. The computer revolution is not over—it is accomplished. We now live with computers.

This point was most clearly demonstrated to me recently when I purchased a long-promised sewing machine for my wife. The brand of choice was a "New Home," and it is advertised as the "Ladies' Computer." (I will quickly state that I did not make up that slogan, and I should not be blamed for it!)

This machine contains read-only memory (ROM), a microprocessor, some random-access memory (RAM), several stepper motors, and a touchpad with dozens of choices for different stitches to be performed. Pressing a button can cause the thing to place an airplane design on a shirt pocket without any effort. The built-in letters can be used to spell a name, and the machine can remember the name and spell it repeatedly all over a piece of material.

Users do not need to care at all how the microprocessor does what it does. They simply need to push a button. I suspect that this sewing machine may be used to make shirts, pants, and other ordinary items. Thus far, though, we have been having too much fun with the special features to attempt such routine tasks.

All this may not have a lot to do with the Z100, but I truly don't think that we computer hackers should give in to the preachers of gloom. Use your imagination. Design stuff, as the hackers of ten years ago did, on the kitchen table. If we can have a computerized sewing machine, we can have computer-controlled haircutting machines, trash cans, laundry sorters, ...

RAM disks

Whether you are a hard- or a floppy-disk user, there will come a time when you will find yourself thinking, "I wish that the computer didn't have to access the disk so much."

With me, that feeling started back when I owned an H89 and the head loading and unloading would cause the disk drive to clack loudly. I always felt that the next clack would be the last. (But I never did experience a disk-drive failure in that machine.)

On the Z100, floppy-disk access slows things down; but when I managed to get a hard-disk machine, I continued to have the fear that disk-failure chances were directly related to the number of disk accesses. I am no psychologist, but I can say this: fear of losing one's work will not lessen stress levels nor enhance the joys of computing. The famous "Seek error. . ." message can cause even the strongest sort to whimper.

The strategy that I recommend for minimizing the number of disk accesses is to use a RAM disk. A region of memory is set aside and recognized by the computer exactly as if it were a formatted disk. Versions 2 and later of the Microsoft Disk Operating System (MS-DOS) come with software to establish a RAM disk. There are also some public domain RAM-disk products that will allow users of the Zenith Disk Operating System (Z-DOS) to use a RAM disk.

Here, I will look at the RAM-disk programs that come with MS-DOS, as well as at an interesting hardware product by Lomas Data Products, the NV Disk. For the many people who have not yet upgraded to MS-DOS 3, both the MS-DOS version 2 and version 3 RAM-disk software will be covered.

A RAM disk, sometimes known as a virtual disk, is installed as a device driver when the Z100 is booted. This is done by the command

DEVICE = <FILENAME.EXT>

where <FILENAME.EXT> is the name of your RAM disk's device driver.

Simply include the appropriate command as a line in the CONFIG.SYS file on your boot disk. (If you don't have a CONFIG.SYS file, it's an ordinary text file and can be created with any editor.) The first RAM disk created will be drive I:. If your CONFIG.SYS file contains more than one DEVICE line, subsequent RAM drives will be created as drive J:, drive K:, etc.

It is permissible for the DEVICE statement to include a path name before the RAM-disk driver's name, allowing the device driver to be in a directory other than the root directory.

. . .MDISK.DVD in MS-DOS 2

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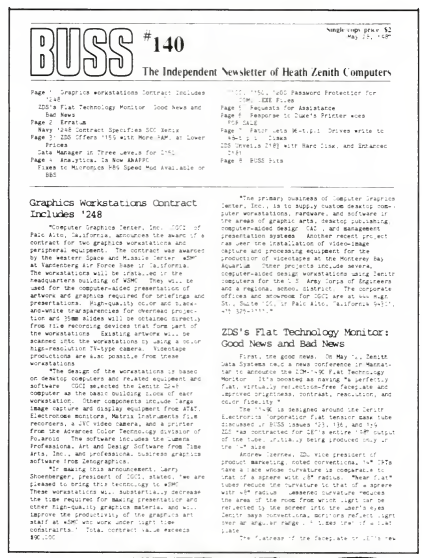
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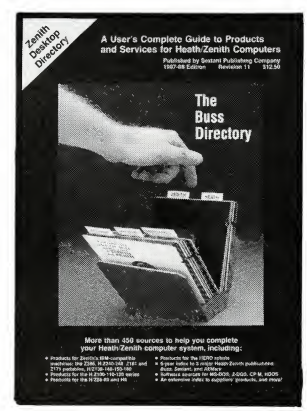
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```
PAUSE Insert the MS-DOS ver II System Disk number 2 in drive B:
COPY B:DEVEL\LINK.EXE
COPY B:DEVEL\EXE2BIN.EXE
PAUSE Insert the Programmer's Utility Pack disk UTILITIES in drive B:
COPY B:MASM.EXE
COPY B:MDISK.ASM
PAUSE Insert the Programmer's Utility Pack disk Z100 BIOS SOURCES in drive B:
FOR %%F IN ( PARMS MACLIB DEFASCII DEFMS DEFDEV ) DO COPY B:%%F.ASM
MASM MDISK;
LINK MDISK;
EXE2BIN MDISK.EXE MDISK.DVD
FOR %%F IN ( MASM LINK EXE2BIN MDISK ) DO DEL %%F.EXE
FOR %%F IN ( MDISK PARMS MACLIB DEFASCII DEFMS DEFDEV ) DO DEL %%F.ASM
DEL MDISK.OBJ
CLS
REM       Place MDISK.DVD on your boot drive and include the line:
REM                 DEVICE = MDISK.DVD SIZE =  Number of K
REM       in a file named CONFIG.SYS on the boot drive.
REM       Example: DEVICE = MDISK.DVD SIZE = 100
REM       This would produce a 100K RAM drive I:
```

Listing 1. Contents of a batch file (.BAT extension) that allows you to produce MDISK.DVD from the MDISK.ASM source code that comes with the MS-DOS 2 Programmer's Utility Pack. This version of MDISK lets the user set the size of the RAM disk.

```
DEVICE = drive:pathname\VDISK.SYS disk_size sector_size dir_size/E
```

Figure 1. General form of a DEVICE = command line (in the CONFIG.SYS file) to set up VDISK.SYS as a RAM drive under MS-DOS 3. (See text for a discussion of the various elements of the command line.)

subdirectory named DEV. This file is MDISK.DVD; when installed as described above, it will produce a 64-kilobyte RAM disk. (This RAM disk includes its own directory and file-allocation table, and these reduce the total available space to about 58K.)

Unfortunately, this version of MDISK does not allow the user to change the RAM disk's size. So, even people with computers containing 768K of RAM are stuck with a rather small RAM disk. This version of the driver is also limited to a maximum of 16 directory entries. (The usage of the MDISK.DVD program is discussed briefly on page 9.21 of the MS-DOS 2 manual.)

. . .The PUP MDISK

When Heath/Zenith produced the Programmer's Utility Pack for MS-DOS version 2, a modified MDISK version was included on the UTILITY disk. This MDISK version allows the user to vary the MDISK size. However, it is provided as assembler source code; it requires assembly, linking, and conversion into the correct format for a device driver. For reasons that escape me, Heath/Zenith chose not to include a .DVD file for this driver on the disks.

In *Sextant* #28, May-June 1987, there's a "Standard Operating Procedure" that uses MDISK.DVD to illustrate the assembly process. (See "Assemble a New Memory Disk for Your '100," by John J. Batbie, Jr.) In Listing 1, I've given a batch file that will allow you to easily create the new MDISK.DVD for use with MS-DOS version 2.

To construct the new version, you can use the following procedure:

1. Place Listing 1 on a disk that has been formatted as a system disk (i.e., formatted with the /S switch).

To complete construction of the driver, the disk needs to have at least 170K of free space. The batch file assumes that this disk is placed in the default drive. It could also be a hard-disk partition.

2. Run the batch file. The batch program will ask that you insert the following disks (or duplicates): the system disk from MS-DOS version 2, the Utilities disk from the MS-DOS version 2 Programmer's Utility Pack (PUP), and the BIOS Sources disk from the PUP.

The batch file will then transfer a number of files to your system disk. After the new MDISK.DVD is created, these files will be deleted and the disk will be left with the new driver.

3. Copy the driver to your boot disk and include the following line in the CONFIG.SYS file:

DEVICE = MDISK.DVD SIZE = <size>

Here, <size> is any number of kilobytes from 32 to 640.

. . .VDISK.SYS in MS-DOS 3

An entirely new version of the RAM-disk software is distributed with MS-DOS version 3. With that version of the operating system, the driver has been renamed to VDISK.SYS, and has been significantly improved. The new driver may be found on system distribution disk number 2. (VDISK.SYS is explained on page 11.385 of the version 3 manual.)

VDISK.SYS allows the user to set any of

the following parameters for the RAM disk: size, sector size, and maximum number of directory entries. In addition, a switch is provided to allow the use of memory greater than one megabyte for the RAM disk. The syntax of VDISK's DEVICE statement is shown in Figure 1.

<drive:pathname> is an optional drive and path designation for the location of the VDISK.SYS program.

<disk_size> is the optional designation of the size of the RAM disk. Without a specification, the value defaults to 64K. The maximum allowable value is the size of your machine's memory; the minimum is 1K. In any event, the RAM disk's size will automatically be adjusted to ensure that the machine has at least 64K of memory left for program use.

<sector_size> is an optional parameter that allows the user to select the disk sector size to be 128, 256, or 512 bytes; the default is 128. (If a large RAM disk is to be used, the largest sector size would be the most efficient for accessing the disk.)

<dir_size> allows the user to select the number of allowed entries in the RAM disk's directory. This value defaults to 64. The allowed range of entries is from 2 to 512.

/E is an optional switch that allows the RAM disk to reside in "Extended memory"—that is, above one megabyte. Clearly, this option is useful only if your computer has more than a megabyte of RAM.

The VDISK.DVD version of the RAM-disk software is certainly the most developed of the three discussed. It may not be adequate reason by itself to upgrade to version 3 of MS-DOS, but it is certainly one reason. (I took an overall look at the upgraded features of version 3 in the "Z100 Notebook" in *Sextant* #23, July-August 1986.)

The NV Disk from Lomas

In an application where professional data base management is required, you quickly find that floppy disks do not make the grade. There is simply not enough storage space to handle most applications, and floppy-disk speed detracts significantly from the system's overall performance.

The usual answer is to step up to a hard disk, with an adequate backup facility to allow security against disk failure. Hard disks, however, have some disadvantages that are not well known. One disadvantage is security of information.

If you need to be sure that data will not be available to others either before or after it is deleted, then you cannot really feel safe using a hard disk. Security rules used by most organizations forbid using a hard disk unless the disk and the machine are afforded the same level of security as the information itself. Floppies can be put under lock and key quite conveniently; not so, however, an entire computer.

Lomas Data Products has one solution to this dilemma—the NV Disk. This product is a board that plugs into one of the Z100's S100 expansion slots. For $995, the NV Disk package will provide you with two megabytes of RAM-disk storage without using any of the computer's system memory.

For security, a large data base can be broken into small sections and stored on floppy disks; then it can be joined together on the two-megabyte NV Disk prior to use. This process could be handled by the data base software as part of the daily sign-on and sign-off procedure. Removable hard disks would serve a similar purpose, but these systems would add significantly to the cost of the system.

The NV Disk is shipped with a special driver that is installed using a DEVICE line in the CONFIG.SYS file, as were the drivers discussed in the last section.

You should have some technical knowledge (or support available) for initial installation. You need to select an input/output port number for the disk driver, configure both the driver and the board's DIP switches for that port number and, finally, follow the instructions available in the program source code for assembling the code. You'll want the Programmer's Utility Pack for its assembler.

I experimented with an NV Disk for a while. I must admit, being a RAM-disk fan, that having two megabytes of RAM disk is great. Imagine being able to put in memory several C compilers, word processors, and whatever else, all at once. You could work for an entire day without seeing the drive light come on once. (The contents of the NV Disk will survive a system crash or reset, but they will not survive a power failure.)

Lomas Data Products also produces ordinary memory boards. These boards are designed in 256K, 512K, 1-megabyte, and greater sizes. (To give you an idea of prices, they start at $475 and go up to $1,095.) I have tried the 512K board with a new 8-megahertz Z100, and with an old-motherboard Z100 running both with and without the C.D.R. speed-up modification. In everything I tried, the Lomas boards performed without a fault.

The memory board did not function with the UCI EasyPC IBM-emulation board set installed. But that is to be expected, since the EasyPC interferes with the normal functions of the S100 bus. The EasyPC won't work with earlier Z100 UCI memory boards.

The Lomas Data Products NV Disk board is priced a bit high compared to other add-ons, but is consistent with other memory products on the market. As I said above, one place where it would be really valuable is in certain professional areas where information security is important. Other people might find it useful in handling large data base files.

A war game—Berlin

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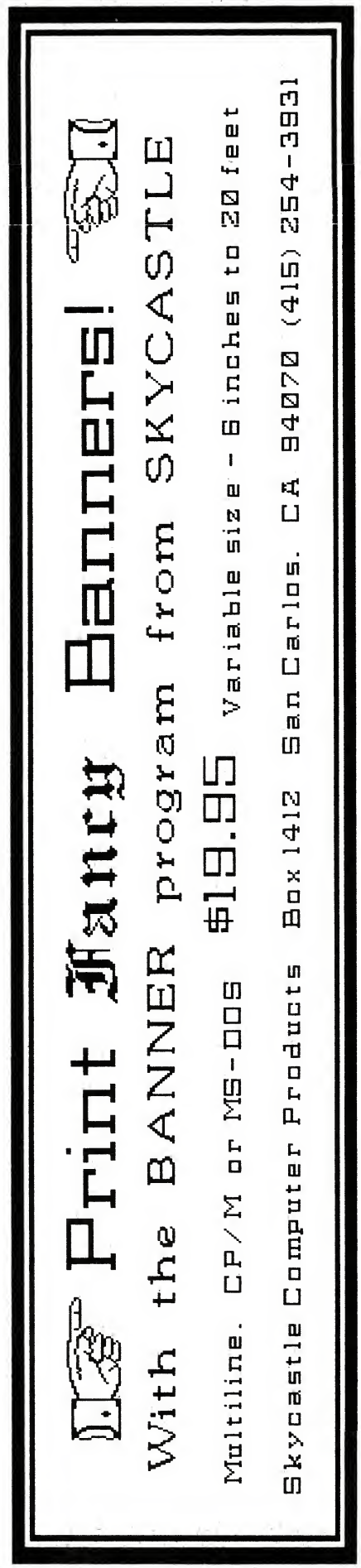
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the user's index fingers to games that require slow and careful thought. I find the first type boring (although I never seem to get beyond level one). The second often take days to learn, and years to play to completion. Few folks have the time.

Sirius Software seems to have found an interesting middle ground in their new game, Berlin. At issue is the air war over Germany during the Second World War. The Americans have fighters and bombers; the other side has only fighters. The Americans plan and execute bombings of the German cities, and the Germans act to defend against these attacks.

This is no arcade game; it's more akin to a computerized command and control system. You may recall seeing World War II films where models of ships and aircraft were moved around a giant map board of Germany. For $39.95, Berlin will give you a computerized equivalent of that board, and calculate just how successful your command decisions would have been under the actual probabilities at work during the war.

The program is a technical masterwork. The screen is set up as a detailed grid pattern overlaying an approximate map of Germany. The players control their aircraft with the goal of outsmarting the opposite side. A single individual may select to play against the computer. With two players, each may assume the role of one side.

You each select aircraft from a set of the aircraft types that were available to each side during the War. The defender positions aircraft around Germany in what is hoped to be a good defense. The attacker selects a departure point, a target, and the aircraft that will conduct the raid. After that, it's up to the computer.

The planes for each side move across the grid, with their speed and endurance based on their actual wartime capabilities. In addition, air battles are resolved based on the actual statistics for success and failure of the aircraft armaments and the number of planes involved. After a raid, both sides get to re-deploy their forces.

If you are a game fan, you should enjoy this one. If you are also a student of World War II, this game is a must.

The realistic game scenario has an impact. The air in those days was filled with men dying, and the ground was the scene of as great a suffering as has been known. It is hard for me to play a game that relives such an epoch.

Code Corner

There have been a few "Z100 Notebook" articles in the past that presented an algorithm in C for turning screen pixels on and off. In those cases, I mentioned that an assembly language version could set points more quickly than could a C version. The time has come to make good and do a Code Corner containing a fast point-setting routine that can be called by a C program.

The truth is that I am not particularly accomplished as an assembly language programmer, so I thought I would offer a challenge. If you have written a point-setting routine that's faster than the one I give here, send it to me, and I will acknowledge it as a great feat of coding. Your program must do error checking similar to this code, and it must be able to handle colors as well.

One other proviso: I will not accept a routine that makes a look-up table that takes up 1K or more. A simple point-setting program should not consume that much memory.

If you make a point routine that works like mine, but you have a pre-existing data table, your routine will set the first point more quickly. I just didn't want the user to have to type in all that data while copying the code. My routine builds the data table on the first call.

The fastest point-setting routine will get the "Z100 Notebook's Great Coder of The Year" award—enough instant coffee to keep the average programmer working for an entire evening.

My program is NBPOINT.ASM, provided in Listing 2. The code is straightforward, and I have included many comments. (For a superb explanation of the Z100's physical features that are being employed here, I refer you to "Probing the Subconscious Memory of the Z100," by Gary R. Cramblitt, in *Sextant* #24, September-October 1986.)

The NBPOINT routine is designed to work with object files produced by the DeSmet C Compiler; it can be linked to them using MS-DOS's LINK utility. (Should you have some other compiler, refer to your manual for instructions on calling assembly language routines, and modify NBPOINT accordingly.)

Listing 3 is a short example in C to demonstrate calling the NBPOINT routine.

To activate a pixel of a specified color on the Z100 screen, NBPOINT performs the following sequence of actions:

It writes a byte to a port known as ZVIDEO, to establish the required code for CPU screen access (explained below).

It computes the segment offset of the pixel in the screen color segments.

It computes the byte to be written to the screen, with the desired bit set to one.

On the applicable color segments, NBPOINT uses a logical OR to combine the existing screen byte with the new computed screen byte. To erase a bit, an AND instruction is used.

. . .The ZVIDEO control port

The Z100 uses a device known as an I/O Control Port, a 68A21 chip, for controlling both the CPU access to video memory and the display of video memory information on the physical computer screen. This port is located at port

Listing 2. NBPOINT.ASM **is an assembly language routine to turn individual pixels on or off on the Z100 screen. It is intended to be called by C programs written under the DeSmet C compiler. See Listing 3 for a sample C program to call** NBPOINT.

```
;                       nbpoint( x, y, color )
;                       Z100 Notebook
;                       William N. Locke
;
;  Call as:     nbpoint(x,y,color)     DeSmet C Compiler version
;               int x,y,color;
;       color   is : 1 -> Blue     4 -> Green     7 -> White
;                    2 -> Red      5 -> Cyan      0 -> Black
;                    3 -> Magenta  6 -> Yellow
; Uses ES and SI - must be preserved with many compilers: DeSmet, used here,
; does not require preserving these. Use push/pop with other compilers.

TST_PARA EQU    0           ; Set to 1 for input range checking
ZVIDEO  EQU     0D8H        ; Zvideo port address ( Z100 TM page 4.32 )
ZGRNSEG EQU     0E000H      ; Green plain segment address
ZREDSEG EQU     0D000H      ; Red plain segment address
ZBLUSEG EQU     0C000H      ; Blue plain segment address
TSTBLU  EQU     01H         ; Color test bit for the blue plain
TSTRED  EQU     02H         ; Color test bit for the red plain
TSTGRN  EQU     04H         ; Color test bit for the green plain
SCANS   EQU     9           ; Number of Z100 scans
MAX_X   EQU     639         ; Right most pixel number
MAX_ROW EQU     24          ; Bottom most ROW ( 24 or 25 lines )
VAR1    EQU     2           ; | funct( VAR1, VAR2, VAR3 )
VAR2    EQU     4           ; | These numbers are the displacements into the
VAR3    EQU     6           ; | stack for reaching each of the parameters.

;*************************************************************************
;       Macro for marking and erasing each target segment
;       Entry: al - test color, bx - offset, dl - mark mask, dh - erase mask
SEGMARK MACRO   segment, tst_bit; test_bit is 1,2,or 4 for blue, red, or green
        LOCAL   DONE, ERASE ;  ------------------------------------------
        mov     cx,segment  ; | Move the target segment to the es register
        mov     es,cx       ; | for either marking or erasing the point
                            ;  ------------------------------------------
        test    al,tst_bit  ; | If test color does not include the test bit
        jz      ERASE       ; | go to erase line. Otherwise do the marking.
                            ;  ------------------------------------------
        or      es:[bx],dl  ; Mark the target segment with the bit
        jmp     SHORT DONE
ERASE:  and     es:[bx],dh  ; Erase target segment on the bit
DONE:
        ENDM

DGROUP  GROUP   DATA
DATA    SEGMENT WORD PUBLIC 'DATA'
vert_off    DW  225 dup (?) ; Reserve 225 words for vertical offset array.
DATA    ENDS

PGROUP  GROUP   PROG
PROG    SEGMENT BYTE PUBLIC 'PROG'
        ASSUME  CS:PGROUP, DS:DGROUP
        PUBLIC  nbpoint
nbpoint PROC    NEAR

;*************************************************************************
;       Set up ZVIDEO and initialize the vertical displacement table once.
;       These lines get motified to be NOP codes by the preset routine.
PRESET_CODE:
        mov     al,78H          ; | Insure VRAM may be written in all
        out     ZVIDEO, al      ; | plains by placing 78H in ZVIDEO
        jmp     preset          ; Perform self modifying preset procedure

;*************************************************************************
;       Place color segment in es and set up the ZVIDEO port.
PERM_CODE:
        mov     bx,sp  ; Stack pointer to bx for use in indexing memory
        mov     ax,+VAR3[bx]    ; Place the color number in ax: 1 -> 7
IF TST_PARA
        mov     cx,ax           ; Use the cx reg for testing, ax remains
        and     cx,7FFFH        ; Map off negative number high bit
        cmp     cx,7            ; Compare result with 7
        jg      ERROR           ; Jump if resulting cx is gt 7
ENDIF

;*************************************************************************
;       Load values from input stack: x -> bx; y -> si;
        mov     si,+VAR2[bx]    ; y -> si
        mov     bx,+VAR1[bx]    ; x -> bx

;*************************************************************************
;       Process x: check that x is in bounds, derive bit pattern and col
IF TST_PARA
        and     bx,7FFFH        ; Map off negative number high bit
```

address D8 hexadecimal. Bit values at this port have the following effects:

Bit 7 (most significant bit): if this bit is zero, the microprocessor can access the screen memory for direct writing to individual pixels. Otherwise, with bit 7 set to one, the screen will be accessed only through the character-generator ROM. (See p. 4.82 of the Z100 Technical Manual for more on this.) Our program will set this bit to zero.

Bits 4, 5, and 6 provide special access control for the red, green, and blue screen segments (in that order). In each case, if the bit is set to zero, the associated color segment will automatically be changed whenever any one of the other color segments is changed. As an example, if bit 4 is set to zero and a pixel is turned on at some position in the green plane, the red color will also be turned on at that location, making a dot that is a mix of red and green.

Bit 3: If set to zero, all the memory planes that are enabled using bits 0, 1, and 2 will be displayed full on. The screen will be solid color. This bit is set to one for normal applications.

Bits 0, 1, and 2 control the display of the separate color memory planes displayed on the Z100 monitor. If bit 0 is set to one, the red plane is disabled. Otherwise, data on the red plane will be displayed. Bits 1 and 2 perform the same function for the green and blue planes.

Our program sets bits 0, 1, 2, and 7 to

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zero; bits 3, 4, 5, and 6 are set to one. That is, ZVIDEO is set to 78 hex.

To be compatible with the color codes used with the various Zenith versions of BASIC, the program uses the following mapping:
0 = Black; 1 = Blue; 2 = Red; 3 = Magenta; 4 = Green; 5 = Cyan; 6 = Yellow; and 7 = White.

. . .Computing the video offset

The Z100 uses a unique memory segment for each of the three colors used for mixing colors on the screen. These colors are blue, red, and green, and they are located at segment addresses: 0C0000 hex, 0D0000 hex, and 0E0000 hex.

Each of these numbers is the same as the value that is used in the appropriate segment register in Listing 2, except that the register value has one less zero at the end.

The segment register is the upper sixteen bits of the twenty-bit address of the individual pixel. A particular address can be obtained by shifting the register value four times to the left and adding it to an offset computed by the program.

A unique offset can be computed for any screen row, scan line, and column. This offset is used to address a location in any one of the three color segments. There are 80 horizontal columns on the Z100 screen, and each column consists of eight pixel locations. A single offset computation specifies only a given group of eight pixels. The byte that is to be written

H/Z-100
COLOR SOFTWARE

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```
        cmp     bx,MAX_X          ; Compare result with MAX_X
        jg      ERROR             ; Jump if result is not negative
ENDIF
        mov     cx,bx       ;Store horiz_pos in cx
        shr     bx,1        ; x/2
        shr     bx,1        ; x/4
        shr     bx,1        ; x/8 -> This value is left in bx
        and     cl,07H      ;Map off all but the last three bits of cl
        mov     dl,80H      ;Set pattern: 1 0 0 0 0 0 0 0
        shr     dl,cl       ;bit = pattern >> (horiz_pos % 8 ) placed in dl
        mov     dh,dl       ;dl is the mask for pixel marking
        not     dh          ;dh = not ( dl ) is mask for pixel erasing

; ***************************************************************************
;       Process y: check y in bounds, and set y up to index vert_off array
IF TST_PARA
        and     si,7FFFH          ; Map off negative number high bit
        cmp     si,SCANS*MAX_ROW-1; Compare result with mamximum y value
        jg      ERROR             ; Jump if result is not negative
ENDIF
        shl     si,1    ;2*y -> Index the vert_off array in two byte words

;***************************************************************************
;       Combine the vertical offset information with the column
;       and then mark the target screen segments with the bit.
        or      bx,vert_off[si] ; vert offset = 1024*row + 128*scans + column
        SEGMARK ZGRNSEG, TSTGRN ; Mark or erase the green plain.
        SEGMARK ZBLUSEG, TSTBLU ; Mark or erase the blue plain
        SEGMARK ZREDSEG, TSTRED ; Mark or erase the red plain
        mov     ax,1            ; Return 1 to indicate that no error occurred
        ret
ERROR:  mov     ax,0        ; Return 0 to indicate a problem on an error
        ret
END_POINT:

;***************************************************************************
; Initialize the vert_off array in accordance with the following equation:
; vert_offset[y] = 1024 * y/9 + 128 * y%9  [ y =0 -> y = SCANS*MAX_ROW  ]
preset: mov     cx, MAX_ROW         ; Initialize CX - count down MAX_ROW
        xor     dx,dx               ; Clear dx
        mov     bx, offset vert_off ; Obtain the starting address of array
START_ROW:                          ; Start here for each new row
        push    cx                  ; Save the row number
        mov     cx,SCANS            ; Initialize cx with the SCANS = 9
START_SCANS:                        ; Start here for each new scan
        mov     [bx],dx             ; place dx in the position bx in vert_off
        add     bx,2                ; Add two to bx ie next address
        add     dx, 128             ; Add 128 to dx and do next scan
        loop    SHORT START_SCANS   ; Continue until all nine scans done
        add     dx,896              ; To process a new row add ( 1028 - 128 )
        pop     cx                  ; Obtain the current row value
        loop    SHORT START_ROW     ; New row loop or quit if rows done

;***************************************************************************
; Relocate the code after "PERM_CODE" to the position starting at the
; Lable "PRESET_CODE" and then jump up to the start of the moved code.
        mov     si,OFFSET PGROUP:PRESET_CODE; Pointer to destination location
        mov     cx,OFFSET PGROUP:END_POINT - OFFSET PGROUP:PERM_CODE; num bytes
CODMOD: mov     al,cs:(OFFSET PGROUP:PERM_CODE - OFFSET PGROUP:PRESET_CODE)[si]
        mov     cs:[si],al ; Code displaced from "PERM_CODE" to "PRESET_CODE"
        inc     si         ; si is used to index the moved code
        loop    CODMOD     ; loop until all the code is moved
        jmp     PRESET_CODE; Jump to the new location of the nbpoint routine
nbpoint ENDP
PROG    ENDS
        end
```

```
main(){
        int i,j,k,color;
        color = 0;
        for( i = 0; i <= 550; i += 50){
             for( j = i; j < i + 50; j += 1 )
                  for( k = 0; k < 200; k++ )
                       nbpoint( j, k, color );
             if( ++color > 7) color = 0;
             }
        }
```

Listing 3. A short C program to demonstrate the use of the NBPOINT assembly language point-setting routine given in Listing 2.

to the offset location will determine the actual pixels to be affected.

A unique offset is given by the following equation:

Offset = (1,024 * row) + (128 * scan) + column

There are nine scan lines per row on the Z100's screen.

Our point-setting routine accepts the variables x and y to describe the position of a pixel. Here, y is zero at the upper edge of the screen, and increases with each scan line position. Going down to the bottom of the 24th line, y = 215. On the left edge of the screen, x is zero, and increases to 639 on the right edge of the screen.

The row, scan, and column are computed as follows. (Here, / is used for integer division, where the remainder is thrown away; % is used for modular division, where only the remainder is saved.)

row = y / 9
scan = y % 9
column = x / 8

The arithmetic involved in these computations would cause a significant delay in computing the offset. NBPOINT does not actually go through this arithmetic at all. The following trick is used:

To provide the look-up table, an array is set up in memory with offsets for each y value, assuming x is zero (vert_off). This is done only when the first pixel is written.

Each subsequent y value is obtained by a single look-up operation.

The appropriate row value is added to the vertical offset by means of an OR operation, thereby obtaining the final offset.

. . .Compute the byte to be written to the screen

Among the eight bits within a single column location, the actual x position is given by a displacement from the leftmost boundary of the column. (Figure 2 represents this graphically.)

NBPOINT simply takes the provided x input number and strips off all the bits above the third position in that number. (Bits 0, 1, and 2 are retained.) This is the same as obtaining the remainder when the number is divided by eight.

The resulting integer is used as the number of times that the value 1000 0000 binary (80 hex) needs to be shifted to the right. The shifting operation moves the one bit over to the desired location, producing a byte with only the required bit of the eight available set to one.

. . .Use the logical OR

The last step in the point-setting routine is to take the byte computed (and stored in the DL register), and logically OR it with the byte that previously existed in the video memory at the location specified by our computed offset. This action is repeated for each segment that should have the bit turned on.

If a color plane should not have the bit turned on at the location being computed, that bit is turned off by using NOT DL. NOT DL is the complement of the turn-on byte, and is stored in the DH register. The AND instruction is used to combine this new byte with the screen byte.

Both the turn-on and -off functions are performed by the MACRO labelled SEGMARK in Listing 2. The turn-on byte is stored in register DL and the turn-off byte is in register DH.

In NBPOINT, the procedure labelled preset is used to generate the vertical-offset array, our look-up table; preset simply fills out the array with a sequence of numbers that increase by 128 for each new scan line and by 1,024 for each new row.

The preset routine is not called each time that NBPOINT is called. Once the look-up table has been generated, there's no point reconstructing it. So, besides generating the array, preset modifies the program by moving up all the code between the labels PERM_CODE and END_POINT. This code is moved up such that it overwrites the instructions for setting ZVIDEO and calling preset.

If we left those instructions intact, preset would have to set a flag after the array was generated. Each subsequent time that NBPOINT was called, preset would have to test for that flag and jump, which would slow things down.

And I want to keep things as fast as possible, of course, since I've got that instant coffee riding on NBPOINT's speed.

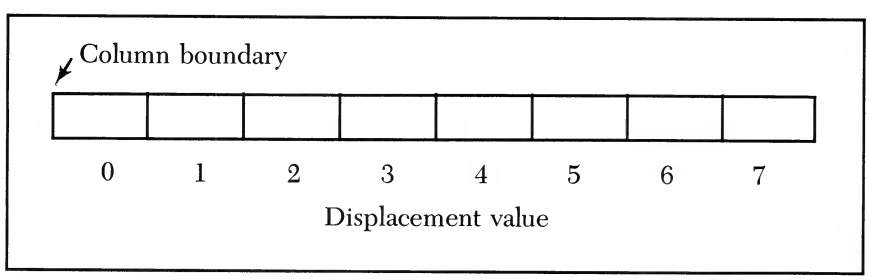

Figure 2. Horizontal displacement of pixels in a column. The NBPOINT routine (Listing 2) accepts an x value that gives the horizontal position of a pixel to be turned on or off. The column location is determined by dividing that x value by 8 (dropping the remainder). The horizontal displacement within that column is determined by modular division (x MOD 8), keeping only the remainder.

As with the other programs carried in this column, I will upload NBPOINT onto the HUG SIG on CompuServe. Or, if you prefer, I can send you a copy of NBPOINT (and any other "Z100 Notebook" programs) on disk for $20. Mail requests to William N. Locke, P.O. Drawer M, Hampton, VA 23666.

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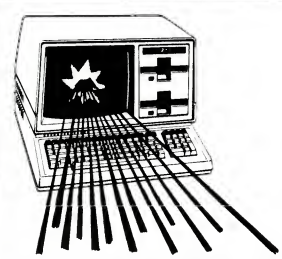

COLOR-36

COLOR-36 is an assembly - language routine that allows the BASIC programer to paint in 36 colors. This routine works with Zenith's Z-BASIC and Microsoft's GW-BASIC when used on the H/Z-100. It can be used with interpreted as well as compiled BASIC and is faster then the normal basic paint.

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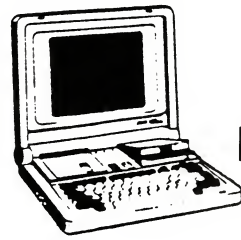

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A program to help you cope with the Z100's WILD INTERRUPT message.

Robert S. Logan

I work for a university that has a large number of IBM Personal Computers and also many H/Z100s. Our Z100 users (including me, since I have one at home) are always interested in finding additions to our software library. So, each month I evaluate public domain software for compatibility with the H/Z100. These programs are written primarily for the IBM PC, and usually they either work fine or immediately cause a "wild interrupt" because they call for system services specific to the IBM.

Unfortunately, Heath/Zenith's Z100 implementation of the Microsoft Disk Operating System (MS-DOS) is very unhelpful when it gets an interrupt requesting an unknown service; it simply prints WILD INTERRUPT and returns to the program. The program being tested often gets stuck in an endless loop of wild interrupts. Rebooting soon becomes very annoying, so I quickly decided to install my own wild-interrupt handler.

The result is TAME.COM, a program I wrote in assembly language. (See Listing 1.) TAME displays a snapshot of the values in the memory registers of the '100's 8088 central processing unit (CPU) at the time of the unrecognized interrupt. These values give the entire internal state of the CPU; they will show, for instance, the location in the program from which the bad call was made. To find out the number of the interrupt, you can look at the code at the bad-call location.

Immediately after it gives you that snapshot, TAME terminates the program; then it returns you to the operating system, leaving the information on the screen. With the information TAME provides, a programmer can determine what the program was trying to do.

You will, of course, also need a reference to the IBM-PC software interface. A good deal of information can be found, for instance, in the manuals that come with Zenith's Programmer's Utility Pack for version 2 and later of the Microsoft Disk Operating System (MS-DOS).

For example, if the interrupt was number 10 hexadecimal, that is the call recognized by IBM's read-only memory (ROM) for video input/output (I/O). The particular I/O function requested can be determined from the contents of register AH (the first two digits of AX). Knowing what function the program is requesting, you could patch the program to perform an equivalent function on the Z100.

TAME displays the CPU registers at the time of the wild interrupt.

Besides making it easier to test IBM programs, TAME is useful for debugging in general. (At the very least, you'll be able to run some other program without having to reboot.)

The basic idea

The 8088 hardware uses the lowest kilobyte of memory to hold an interrupt-vector table. Each entry in this table consists of the address (in segment plus offset form) of the routine that handles the associated interrupt. This is true for both hardware- and software-generated interrupts.

In its implementation of MS-DOS's basic input/output system (BIOS), Zenith puts the address of its wild-interrupt routine into the table entries for all undefined interrupts. Rather than redirecting the undefined interrupts by changing each of the table entries, TAME takes advantage of the fact that they all go to the same place, and redirects from there.

To find the address of the BIOS's routine for handling undefined interrupts, TAME goes to the entry for interrupt EFh (which is reserved for user interrupts). TAME then places a patch at the start of the undefined-interrupt routine; this patch will simply cause a jump to TAME's own handler. Thus, control will be passed to TAME whenever an undefined interrupt is encountered.

Once TAME has control, it displays the current values of the registers and stops the program. Stopping is easy in MS-DOS version 2, since there is a system call to do the job. It is a bit harder under the Zenith Disk Operating System (Z-DOS), Zenith's implementation of MS-DOS 1.

MS-DOS's usual termination requests require that the address of the program segment prefix (PSP) be in the code-segment (CS) register at the time of the termination call. This information is not easy to recover when a wild interrupt occurs. Fortunately, Z-DOS's usual Control-C handler can find this address, and in fact will do the proper termination. (However, this default routine is not necessarily the CTRL-C handler that is in effect during a wild interrupt; so when TAME is first invoked, it must save the correct CTRL-C handler's address.)

The preliminaries

Let's now go through TAME in some detail.

To begin with, two macros, SAVEALL and RESTALL, are defined; they will be used in saving and restoring most of the registers.

In the next section of the program, the SEGMENT directive gives the name INT_SEG to the area of memory containing the parts of the interrupt-vector table that TAME will use: the entries for the CTRL-C interrupt and the EFh interrupt.

The area of memory that is defined as MTR_SEG is the location of a table in the monitor routines in the '100's ROM. This table contains the address of the ROM's terminal emulator. (This segment information is given in appendices I and J of the Z-DOS manual, and in chapters 4 and 8 of the manual for the MS-DOS Version

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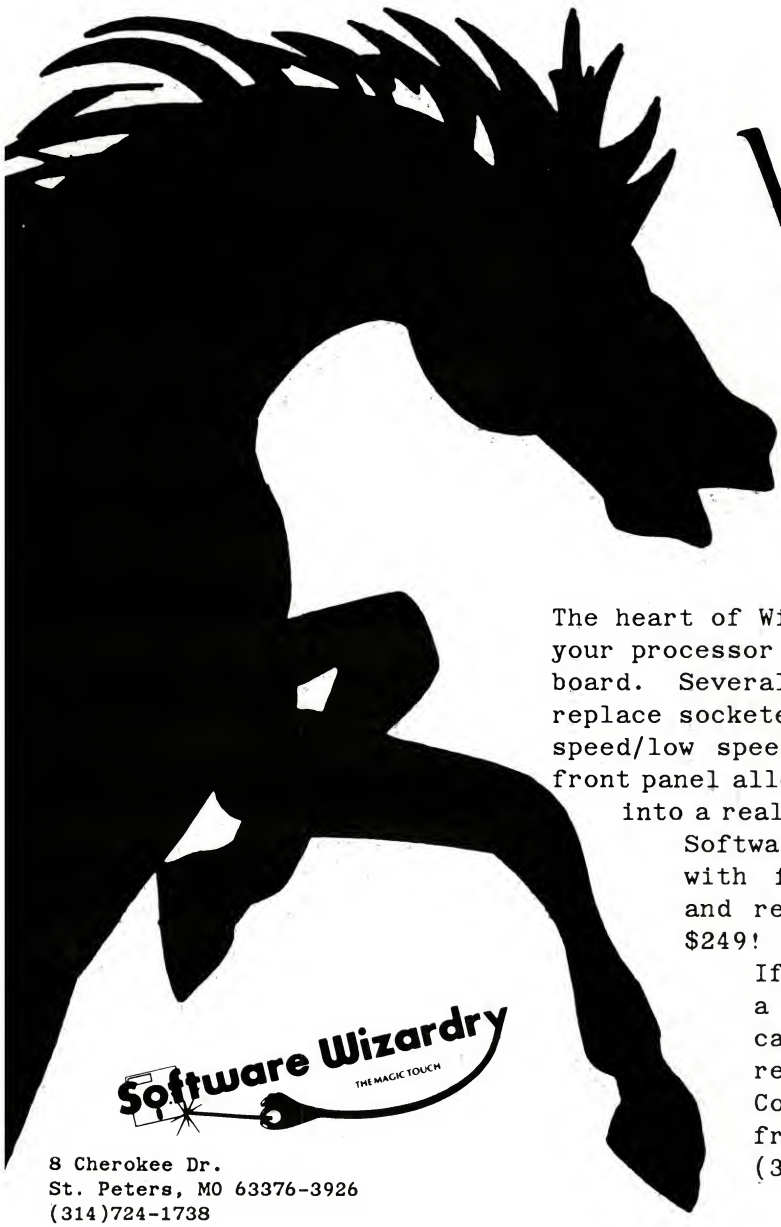

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2 Programmer's Utility Pack.)

The SEGMENT, ASSUME, and ORG statements are a normal part of any .COM program. Such programs always start with all segment registers pointing to the PSP.

The SEGMENT statement tells the assembler that this is where the code starts. The ASSUME command tells the assembler what will be in the registers when execution begins. Note that this command does not actually put anything in the registers; the system does that. The ORG puts the code at an offset of 100h bytes from the start of the program. The system builds the PSP in those 100h bytes.

Setting things up

The first real code is found at the START: label—a JMP to the setup code at the end of the program. A .COM program can have code and data intermixed in the same segment of memory, but it is convenient to put variables near the start of the code so they are easy to find during debugging. The setup code is at the end of the program so that it can be overlaid by the stack area when processing an interrupt. This is a standard way of writing routines that remain resident in memory after they terminate.

The setup code first saves the CTRL-C handler's address. It then uses the interrupt EFh vector to find the BIOS's wild-interrupt handler, and patches in a jump to TAME's routine. It prints a startup message and finally executes MS-DOS's terminate-but-stay-resident call. This call takes as its argument the address immediately above the highest point in TAME's memory space. TAME will remain stored below this address.

When a program executes a system call (a software interrupt) the 8088 pushes the contents of the flags, the CS register, and the instruction-pointer (IP) register onto the current stack. It then starts the appropriate interrupt handler. In the case of a bad system call, the JMP that TAME patched into the BIOS will be executed and TAME will get control. Only the CS register is set up properly when TAME starts, so the CS: prefix is required on the two instructions saving the old stack location (stack segment and stack pointer—SS and SP).

TAME then sets up its own stack area and saves the remaining registers there. It moves the address of its code/data area from the CS register to the data-segment (DS) register so that normal data addresses can be used after this. It sets the base pointer (BP) to the start of the saved registers so that they may be easily found later. (This all takes place between the labels DOINT and EVENWORSE in Listing 1. This area of the code is where the real work is done.)

TAME then displays the WILD INTERRUPT! message, dumps the registers, and terminates the program. It first tries MS-DOS 2's 4Ch function call. If you are running under Z-DOS, this will fail;

Listing 1. When assembled, TAME.ASM will let your Z100 run IBM-specific programs without your needing to reboot if they cause wild interrupts. TAME will print the contents of the CPU registers at the time of the wild interrupt, enabling a programmer to determine its nature and where in the program it was called.

```
        NAME TAME
        TITLE   WILD INT HANDLER FOR Z/100
        PAGE    ,132
;
;       replacement for wild int handler
;
;       Robert S. Logan
;       Caltech
;       version 1.1  7-jul-1985
;
;       to make TAME.COM
;               type in this file (TAME.ASM)
;               MASM TAME;
;               LINK TAME;
;               EXE2BIN TAME.EXE TAME.COM
;               DEL TAME.EXE
;
SAVEALL MACRO           ;save all registers on stack
        PUSH    AX
        PUSH    BX
        PUSH    CX
        PUSH    DX
        PUSH    SI
        PUSH    DI
        PUSH    BP
        PUSH    DS
        PUSH    ES
        ENDM
;
RESTALL MACRO           ;restore all registers from stack
        POP     ES
        POP     DS
        POP     BP
        POP     DI
        POP     SI
        POP     DX
        POP     CX
        POP     BX
        POP     AX
        ENDM
;
INT_SEG SEGMENT AT 0H
        ORG     4*023H                  ;control-c routine
OLDCCI  EQU     THIS WORD
        ORG     4*0EFH                  ;highest reserved to user int routine
OLDWI   EQU     THIS WORD               ; assume still points to default wild
INT_SEG ENDS                            ; interrupt routine
;
MTR_SEG SEGMENT AT 0FE01h
        ORG     19H
MTR_SCRT LABEL FAR                      ;smart terminal handler
MTR_SEG ENDS
;
;
CODE    SEGMENT PUBLIC
        ASSUME CS:CODE,DS:CODE,ES:NOTHING
        ORG     100H
;
START:  JMP     SETUP   ;.COM programs always start here
                        ;go do setup functions
;
;       data
;
INTSP   DW      0                       ;for user's
INTSS   DW      0                       ; stack pointer
INTCTLC DW      0                       ;saved default control-c handler
        DW      0                       ; assume will stop task (1.x only)
;
;       process wild interrupt
;
DOINT:
;
        MOV     CS:INTSP,SP
        MOV     CS:INTSS,SS             ;save old stack
        PUSH    CS
        POP     SS
        MOV     SP,OFFSET ENDALL        ;set up our own
;
        SAVEALL                         ;put all regs on our stack
;
```

→

```
        PUSH    CS
        POP     DS                      ;set up ds addressing
        STI                             ;let ints thru now
        MOV     BP,SP                   ;set bp to point to
        ADD     BP,16                   ; ax on our stack
;
        LEA     SI,WILD                 ;print tough luck message
        CALL    OUTS
        CALL    SNAP                    ; print regs
        MOV     AL,1
        MOV     AH,Ø4CH
        INT     21H                     ;terminate user prog
;
        PUSHF                           ;oops... must be version 1
        PUSH    CS                      ; so try default control-c rtn
        MOV     AX,OFFSET EVENWORSE
        PUSH    AX
        JMP     DWORD PTR INTCTLC
;
EVENWORSE:
        MOV     AX,CS                   ;oh no!! should never get here
        MOV     DS,AX                   ;struggle back to life
        CLI
        MOV     SS,AX
        MOV     SP,OFFSET ENDALL
        STI
;
        LEA     SI,DOOM                 ;tell user the bad news
        CALL    OUTS
BADNEWS:
        JMP     BADNEWS                 ;try not to make things impossible
;
;
DOOM    DB      "sorry, you will have to reboot",ØDH,ØAH,Ø
WILD    DB      ØDH,ØAH,"WILD INTERRUPT!",ØDH,ØAH,Ø
;
;
OUTCH   PROC    NEAR            ;output char in al to screen
        SAVEALL                 ;save everything
        CALL    MTR_SCRT        ;call rom routine
        RESTALL                 ;restore everything
        RET
OUTCH   ENDP
;
OUTB    PROC    NEAR            ;print a blank
        PUSH    AX
        MOV     AL,' '
        CALL    OUTCH
        POP     AX
        RET
OUTB    ENDP
;
OUTS    PROC    NEAR            ;output Ø terminated str at [si]
        PUSH    SI              ; to screen
OUTS1:
        MOV     AL,BYTE PTR[SI] ;get next byte
        CMP     AL,Ø            ;check for end
        JE      OUTS2
        CALL    OUTCH           ;output the char
        INC     SI
        JMP     OUTS1           ;do the rest
OUTS2:
        POP     SI
        RET
OUTS    ENDP
;
OUTW    PROC    NEAR            ;output ax in hex
        PUSH    DX              ;save regs
        PUSH    CX
        PUSH    BX
        PUSH    AX              ;save arg
        MOV     DX,4            ;4 nibbles in a word
OUT1:
        POP     BX              ;get remaining nibbles
        MOV     CL,4
        ROL     BX,CL           ;get next nibble
        PUSH    BX              ;save rest
        AND     BX,ØFH          ;isolate nibble
        MOV     AL,BYTE PTR HEXTAB[BX]  ;convert to hex
        CALL    OUTCH           ;output the char
        DEC     DX
        JNZ     OUT1            ;do all
        POP     AX              ;clean stack
        POP     BX              ;restore regs
        POP     CX
        POP     DX
        RET                     ;finished
OUTW    ENDP
```

→

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TAME will then try to simulate a CTRL-C interrupt by pushing reasonable values onto the stack first. The values are set to pretend that a CTRL-C occurred during an operating-system call happening immediately before the label EVENWORSE. Although this should always work, TAME prints the DOOM message and loops if it does not.

Doing the work

Within TAME, there are several small utility routines that do most of the work. One that is used by a number of other routines is OUTCH; this routine displays on the screen one character passed to it in the accumulator (AX) register (the AL register together with the AH). OUTCH uses the monitor ROM's terminal emulator to do this. Note that all registers must be saved before and restored after the ROM call.

The routine OUTS uses OUTCH to print a zero-terminated string pointed to by the source-index (SI) register. OUTB puts out one blank.

OUTW is a bit tricky. It takes the two-byte word in AX and outputs it in hex. It uses the ROL instruction to process the argument a nibble (four bits) at a time; it goes from left to right, keeping a copy on the stack. It converts each nibble to its ASCII representation and uses OUTCH to display it.

Finally, SNAP uses these routines to print all the registers. It gets the registers from various places: AX, BX, CX, DX, SI, DI, BP, DS, and ES are on TAME's own stack; CS, IP, and the flags are on the errant program's stack; and SS and SP were saved in TAME's variable area.

And finally. . .

To create TAME from source, you will need MASM, LINK, and EXE2BIN. The versions of these three included with Z-DOS will work. If you have MS-DOS 2, you can use the versions of LINK and EXE2BIN included there, and get MASM from the Programmer's Utility Pack.

Assemble TAME, then use LINK to produce TAME.EXE. (LINK will complain about a missing stack segment, but this is normal for a .COM program.) Next, use EXE2BIN to convert TAME.EXE to TAME.COM. To avoid confusion, delete TAME.EXE.

Finally, remember to run TAME before trying anything that might cause a wild interrupt. The easiest way to do this is to put TAME as a command line in your AUTOEXEC.BAT file; then it will be loaded every time you boot your system.

Additional Information

MS-DOS Version 2 Programmer's Utility Pack, #CB-5063-16, $149;
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```
;
HEXTAB: DB      "Ø123456789ABCDEF"
;
SNAP    PROC    NEAR
                                ;output regs from stack
        PUSH    BX
        PUSH    SI
        PUSH    BP
        LEA     SI,REGMESS      ;print header
        CALL    OUTS
        MOV     BX,9            ;9 regs on stack
SNAP1:
        MOV     AX,[BP]         ;get word from stack
        CALL    OUTW            ;print hex
        CALL    OUTB            ; then a blank
        DEC     BP
        DEC     BP
        DEC     BX
        JG      SNAP1           ;print them all
;
        MOV     AX,INTSS
        MOV     ES,AX
        MOV     BX,INTSP        ;ex:bx points to int info
;
        MOV     AX,ES:[BX+4]    ;print user's flags
        CALL    OUTW
        CALL    OUTB
        MOV     AX,ES:[BX+2]    ;print user's cs,
        CALL    OUTW
        CALL    OUTB
        MOV     AX,ES:[BX+Ø]    ; ip,
        CALL    OUTW
        CALL    OUTB
        MOV     AX,INTSS        ; ss,
        CALL    OUTW
        CALL    OUTB
        MOV     AX,INTSP        ; and sp
        ADD     AX,Ø6           ; correcting for int
        CALL    OUTW
        LEA     SI,REGCRLF      ;finish with a crlf
        CALL    OUTS
;
        POP     BP
        POP     SI
        POP     BX
        RET
SNAP    ENDP
;
REGMESS DB      " AX   BX   CX   DX   SI   DI   BP"
        DB      "   DS   ES   FL   CS   IP   SS   SP"
REGCRLF DB      ØDH,ØAH,Ø
;
;               here is the setup code
;               it is last so that it may be overwritten
;               by the stack
;
SETUP:
        XOR     AX,AX
        MOV     ES,AX
;
        MOV     AX,ES:OLDCCI                    ;save default control-c
        MOV     INTCTLC,AX                      ; handler address
        MOV     AX,ES:OLDCCI+2                  ; (used for 1.x only)
        MOV     INTCTLC+2,AX
;
        MOV     SI,ES:OLDWI
        MOV     ES,ES:OLDWI+2                   ;es:si == start of old wild
                                                ; interrupt rtn in bios
        CLI                                     ;ints off
        MOV     AL,ØEAH                         ;"far jmp direct"
        MOV     ES:BYTE PTR[SI],AL
        MOV     AX,OFFSET DOINT                 ; to doint
        MOV     ES:WORD PTR[SI+1],AX
        MOV     AX,CS
        MOV     ES:WORD PTR[SI+3],AX            ; in this seg
        STI                                     ;ints back on
;
        LEA     SI,HELLO                        ;announce presence
        CALL    OUTS
        MOV     DX,OFFSET ENDALL                ;get address beyond our stack
        INT     27H                             ;terminate but stay resident
;
HELLO   DB      "TAME v1.Ø installed",ØDH,ØAH,Ø
;
ENDALL  EQU     THIS BYTe + 1ØØH        ;space for stack
CODE    ENDS
        END     START
```

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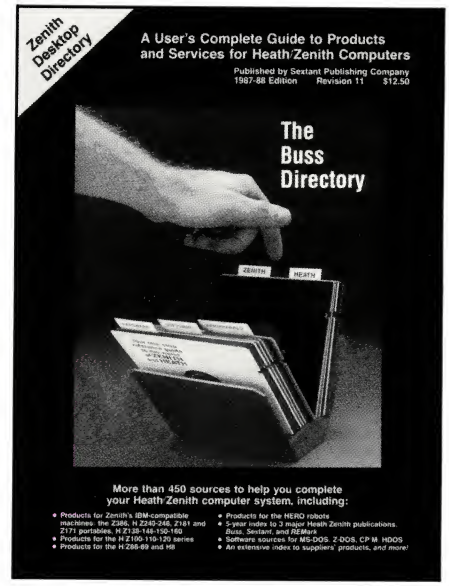
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SigmaSoft's Hard Disk for Your '8 or '89

Both CP/M and HDOS are supported. Prices start around $800,* including *the controller.

Kenneth A. Patrick

Back in *Sextant* #18, September-October 1985, I had an article on SigmaSoft and Systems' Interactive Graphics Controller (IGC) ("A Look at SigmaSoft's Interactive Graphics Controller"). If you read it, you know how I feel about my H89. I like it, it's useful, and I want to make it even more useful.

I suspect there are several "K" of '89 and '90 owners (and H8 owners) who would agree with me. SigmaSoft's new Hard Disk Subsystem only reinforces my allegiance, and will do the same for all those smart enough to buy one for themselves.

SigmaSoft offers the subsystem in several versions, ranging from an internal 10-megabyte hard disk at $795 to an external 40-MB system at $1,350. (See Table 1 for a full list.) The external systems work with the H8, as well as with the '89.

I opted for the external 20-MB system. Past experience showed me I'd fill up whatever I bought, and 20 MB was the most cost effective unit I could afford.

Here's what you get for $995:

1. Seagate ST-225 20-MB half-height hard-disk drive.
2. Western Digital hard-disk/floppy-disk controller card, the WD1002.
3. Elegant (color-matched to the '89) steel drive cabinet—which has room and power for a second drive!
4. Six-foot ribbon cable.
5. Parallel-interface card (16 ports) that fits in one of your H89's *left*-side (memory-expansion) slots.
6. SigmaROM replacement for your Monitor-90 read-only memory (ROM) chip.
7. SigmaSoft's support-software package for both the CP/M operating system and the Heath Disk Operating System (HDOS). This includes device drivers to handle the hard disk and both hard-sectored and soft-sectored floppy-disk drives. It also includes various utility programs, a custom modification of CP/M's basic input/output system (BIOS), and parallel-printer device drivers for both operating systems.

(As it happens, I didn't pay the full price for my hard-disk system. I already had SigmaSoft's parallel-interface card in my machine to run my IGC board. Since the parallel card can do double duty, I got a $95 credit on the price of the hard disk. If you already have an IGC with the 8-port parallel board, you can exchange it for the required 16-port card for $45. If you buy the hard disk now and the IGC later, the credit will apply to that purchase.)

Let's talk about the hard drive first. Whether you get the 10-MB or the 20-MB Seagate, it is a hardy half-height unit that is fairly quiet (except on start-up). It comes with a one-year warranty against defects. SigmaSoft also offers a smaller LaPine 3½" system for *internal* mounting in your '89, and a half-height Seagate ST-251 unit for the top-of-the-line 40-MB system.

In testing the SigmaSoft board and software, I also used a Miniscribe drive from a Z100, a Tandon 30-MB drive, and several others. We'll get to software later; suffice it to say that if you choose to use another brand of disk system (one that conforms to the Seagate ST-506 standard interface), SigmaSoft won't leave you in the cold.

The performance of the system will depend a great deal on the access times of the drive installed. The smaller Seagates have an average access time of 65 milliseconds, faster than most standard drives for the IBM Personal Computer. The Tandon blazed through my tests with an average of about 38 ms, and the big-ticket Seagate runs at 40 ms. (Drive performance is one of the few places where you can still get what you pay for.)

The color-matched drive cabinet has a handsome beveled front panel. SigmaSoft had the supplier match the '89's color scheme and paint texture exactly. There is an excellent 50-watt switching power supply. The drive and the Western Digital disk controller are both fitted into the cabinet and, as noted, there's room (and power) enough for a second drive. A single 34-pin flat ribbon cable connects the subsystem to the '89.

The Western Digital WD1002 controller card has a bonus: it can support up to four floppy-disk drives, plus three hard-disk drives. (CP/M can recognize up to

Drive	Capacity	Mounting	Price
LaPine Titan 10	10 MB	Internal	$ 795
Seagate ST-213	10 MB	External	$ 895
LaPine Titan 20	20 MB	Internal	$ 895
Seagate ST-225	20 MB	External	$ 995
Seagate ST-251	40 MB	External	$1,350

Table 1. SigmaSoft offers a variety of hard-disk packages for the H/Z89. The external drives may be used with the H8 as well as with the '89. The Seagate ST-251 is the fastest, being a 40-millisecond drive; all the others are 65-ms drives. Both internal and external drives come with their own power supply.

Kenneth A. Patrick is not new to Heath/Zenith reviewing. He's surveyed several products within the pages of Sextant, *and is constantly evaluating others at Tex-Matics Micro Systems, his retail store in Plano, Texas.*

three 5¼″ drives at a time; HDOS will support four.)

SigmaSoft's literature expounds on the value of Error Correction Coding (ECC), a feature of the WD1002 controller that makes it faster and more reliable than others on the market. But SigmaSoft has gone beyond the controller's built-in advantages. SigmaSoft's changes to the controller let it emulate all functions of Heath/Zenith's $299 Z37 5¼″ soft-sector controller. (SigmaSoft has considered 8″ drive support, but so far there hasn't been enough demand.)

I already had the Z37 and two high-density (96 tracks per inch, up to 728 kilobytes) floppy drives. With the WD1002 alone, however, I have ample support for high-density drives to back up the hard system. (And right now, the going resale price on a used Z37 controller is about $250; that $250 might come in handy towards a *second* 20-MB drive.)

I described the parallel-interface card in my earlier article. To refresh your memory, though, here are its features:

1. There are 16 parallel ports, with addresses selectable by jumper.
2. Of those ports, two are Centronics standard and, with the supplied software, can drive parallel printers. Printer cables are an extra cost option.
3. Two multi-port connectors provide support for both the hard-disk subsystem and the IGC.
4. You get simple plug-in installation in one slot on the *left* side of the '89; all right-hand input/output (I/O) slots remain intact; and there is still room for the left-slot-mounted 16K memory board.

I was a beta test site

As you know from my previous article, I am a fan of SigmaSoft, as well as a fan of the '89. I've always been impressed by Clay Montgomery, who owns SigmaSoft and does the hardware design, and by Darron Shaffer, who writes most of the software. Also, we're neighbors, sort of. SigmaSoft is located in Dallas, and I have a Zenith Data Systems dealership just outside the city.

So, it wasn't surprising when Clay asked me to be a beta test site for the new system. (In fact, I'd been harassing him about a hard-disk system for some time.)

I didn't even read the instructions to install my system. Installing the hardware for the external drive is straightforward: unplug one chip from the processor board, plug a cable into that socket, and connect the cable to the SigmaSoft interface board; a cable runs from the interface board to the '89's backplate. It's basically the same idea for an internal drive.

As a beta site, I opted to assemble my cabinet and drive several times, using different drives for testing purposes. And being familiar with the parallel card, I already knew which chip on the '89 to pull in order to install the cable.

You'll appreciate the numerous SigmaBIOS versions pre-compiled and ready for installation.

SigmaSoft's attention to detail prevented me from hooking things up backwards by providing polarized connectors for the cables. You are, however, well advised to read the simple (and well-illustrated) instructions carefully while installing.

The last hardware change is to install the SigmaROM. This monitor-ROM replacement is really transparent to most users, except for the version sign-on at power-up and the new S: prompt. The changes affect only the boot operations.

SigmaSoft removed the ROM's support for the Z67 hard disk, and replaced it with support to boot from the new hard-disk subsystem. (If you choose to set the address of the parallel card at other than hexadecimal 00, or if you wish to boot from a floppy drive on the WD1002, you must use the SigmaROM's S(ubstitute) command in order to change the boot port "on the fly.")

File Name	Supported Disk Controllers
SBIOS1.SYS	WD1002 only (hard and floppy)
SBIOS2.SYS	WD1002 and Heath H17
SBIOS3.SYS	WD1002 and Heath H37
SBIOS4.SYS	WD1002 and Heath H47
SBIOS5.SYS	WD1002, Heath H17, and Heath H37
SBIOS6.SYS	WD1002, Heath H37, and Heath H47
SBIOS7.SYS	WD1002, Heath H47, and Heath H17

Table 2. SigmaSoft supplies a number of SigmaBIOS files; these are pre-compiled CP/M BIOS configurations that support various combinations of disk drives used by the H/Z89.

The software *makes it tick*

SigmaSoft knows what it takes to make hardware sell: software. You can sell the highest technology in the world, but if there is no software to drive it, it's just a paperweight on most users' desks.

The hard-disk subsystem comes with a full complement of HDOS and CP/M software (at no extra charge!). It made all the power I purchased readily available. (When I eventually had to read the manual, I found it covered each program and option in clear detail.)

In the following descriptions, I'll be referring to utility programs included in the software package. I am primarily a CP/M user, and the programs described are the CP/M versions. HDOS versions are also included, so aficionados can have it either way. (In many cases, HDOS users will find the CP/M terminology and command formats quite familiar. This is no accident: except for the SigmaBIOS, SigmaSoft developed all the software under HDOS and then transported it to CP/M.)

The first step after hardware installation is to run the hard-disk formatting program, HDFORMAT. Owners of Z100s and newer machines will recognize this as similar to the PREP utility.

The drive is formatted according to several selectable specifications (number of heads, cylinders, sectors per track) and performance options (step rate, skew factor, etc.). SigmaSoft points out that having selectable specifications allows you to use any drive that follows the ST-506 standard.

I expected that the system would be busy for several hours in this phase, as is normal for most 20-MB systems. The HDFORMAT program made relatively fast work of it, finishing in less than 30 minutes. (HDFORMAT doesn't do quite as much testing as PREP, but I've always felt that Heath/Zenith was overly cautious. SigmaSoft points out that extra tests are generally not necessary because of the error-handling capability of the Western Digital controller.) When HDFORMAT was done, it had mapped out bad sectors and given me a clean disk ready for partitioning.

HDPART is used to divide the drive into smaller, more manageable logical drives called partitions. You can define up to 16 partitions, each of which can be in either CP/M or HDOS format. Each partition definition includes number of cylinders, partition name, and target operating system (HDOS or CP/M).

During HDPART, a simple partition table displayed the progress of the changes I made. The table included relative positions of each partition, size in

kilobytes, and target operating system, plus space still not allocated.

The changes were not recorded on the drive until I said so, and I had several chances to change my mind before the big event. Before saving the revised table, I chose a partition that would always be booted by default if no name were specified.

Once HDPART writes the changes, you'll find it has initialized the changed partitions for the operating system specified. (Unlike formatting a floppy, initializing a hard-disk partition does not write some filler character to every byte on the disk. Rather, it is like an erasure of all the file entries in the directory.)

A note to HDOS users is in order. For its directory information, CP/M simply goes to a particular location on disk and starts reading or writing. CP/M partitions are ready for use immediately after HDPART is completed. However, HDOS partitions must be initialized, as always, using INIT.ABS. This will establish empty directory files (DIRECT.SYS, GRT.SYS, and RGT.SYS), and make the drive ready for use by HDOS. From that point on, the hard disk is accessed using the appropriate device driver as always. (CP/M folks may not know what I'm talking about, but if you don't use HDOS, don't worry about it!)

The next step was to get an operating system on each partition that was to be bootable. I needed to access the drive to begin loading software onto it. I did this using SigmaSoft's loadable device drivers (LDDs). Developed initially for the IGC and printer drivers, LDDs do under CP/M what HDOS device drivers do: they make extensions to the operating system in order to support new physical devices. (There's a small cost in memory.)

Using SigmaSoft's SET.COM utility:

```
SET HDC: HELP
```

I checked the options of HDC.DVD, the hard-disk LDD. Once I verified that it was set for the right port address, I used SigmaSoft's ASSIGN.COM utility:

```
ASSIGN D:=CPM1
```

to load the LDD and map access to a CP/M partition I had named earlier. CP/M's standard STAT.COM utility reported that I had just a little under 4 MB of space on drive D:.

(Note that using the hard-disk LDD is required only until the hard disk is made bootable. Its purpose is to allow you to transport SigmaBIOS modules to the hard disk; it's not required once you have a CP/M bootable system that uses SigmaBIOS.)

To configure CP/M for your memory size and drive controller, SigmaSoft includes a smart little program called MOVCPM.COM. It expects to find your serialized version of MOVCPMxx.COM on the installation disk; it just joins itself to that program to automatically generate a bootable hard-disk system in memory, ready for SYSGEN to write it to disk.

SigmaSoft even gets you around the tedious MAKEBIOS process needed to configure the BIOS to a particular disk-drive setup. If you've been irritated by that in the past, you'll appreciate the numerous SigmaBIOS versions already pre-compiled and ready for installation. (See Table 2.) I just placed a copy of my MOVCPM37.COM on the installation disk, ran SigmaSoft's MOVCPM, ran SYSGEN, and *Voilà*!—I had a bootable hard disk.

HDOS folks: after running INIT.ABS on each HDOS partition, use SYSGEN HD0: to get the first HDOS partition bootable. Then just re-boot the system from the hard drive, and propagate HDOS to other partitions as required. It really is as simple as having an ordinary Z37 or Z17 drive.

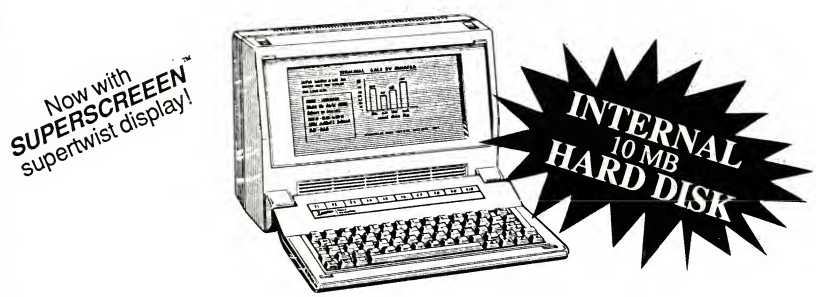
The SigmaROM allows you those standard features that Heath/Zenith's monitor ROMs are noted for—such as being able to boot from a secondary device. I chose to leave my floppy drives (on the Z37 controller) as the primary boot device for other members of my household to use. (Some people just *cannot* adjust to change!) I chose my hard disk, therefore, as the secondary boot device. At the S: prompt, I just type

```
B(OOT) SD<RET>
```

and the hard disk boots in seconds.

I SYSGENed the other CP/M partitions with different versions of SigmaBIOS so that I would have full support available for a variety of drive combinations. On the primary CP/M partition, I use a SigmaBIOS with only hard-disk and WD1002 floppy support. This gives me good performance and maximum transient-program area (TPA).

The SigmaROM allows me to boot another partition (with Z17 support for



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reading distribution disks, for instance) by specifying the partition name when I boot:

B(OOT) SD:CPM2<RET>

Since support for new devices was in order, SigmaSoft wrote a new program, CONFIG.COM, to customize the new SigmaBIOS. You can specify step rates for the new 5¼" soft-sector drive support, and you also have all the standard features available from Zenith's CONFIGUR.COM.

Using ASSIGN.COM to specify drive letters as partition names gives me access to up to four hard-disk partitions at any one time. (In addition, the software support package includes an optional SigmaBIOS that provides up to six partitions.) I used CONFIG to give me a cold-boot auto command line of

ASSIGN B:=CPM2,C:=TEST,D:=DEV

so that all my standard partitions would be available at boot-up.

Other software is included with the hard-disk system:

BRS.COM—actually, you get patches to your Zenith BRS.COM program, an elegant backup-and-restore utility well-documented in the Heath/Zenith CP/M manual. The patches allow you to use BRS.COM to back up files from any disk device to any other disk device.

DD.COM—a public domain sorted disk-directory program; it's worth its weight in gold once you've loaded up your hard disk with hundreds of files.

FDFORMAT—a CP/M floppy-disk in-

Partition	User Area	Usage
CPM (4M)	0	COMMAND.LBR, LRUN.COM, SD.COM, SWEEP
	1	Communications programs
	2	PL/1 compiler and editors
	3	dBASE II distribution files
	4	Sensible Solution distribution files
	5	FORTRAN distribution files
	6	COBOL distribution files
	7	Toolworks C and Viking C subroutines
	8	MBASIC, CBASIC, CB80, BASCOM, BI-80
	9	WordStar, Benchmark
DATA1 (4M)	0	Bootable, with Z17 BIOS support, backup programs, other special utilities
	1	Downloaded files, staging for uploads
	2	PL/1 source modules, load modules
	3	dBASE .CMD files
	4	Sensible Solution .RUN, .SRR, source
	5	FORTRAN source files
	6	COBOL source and COPY files, .COMs
	7	C source and .COMs
	8	BASIC source programs
	9	Documents
DATA2 (4M)	0	ZCPR2 source, SYST90, other system utilities
	1	Breakdown staging for .LBR files
	2	PL/1 test files
	3	dBASE data base files (.DBF, .NDX)
	4	Sensible Solution data base files (.MS, .KS)
	5	FORTRAN test files
	6	COBOL test files
	7	C test files
	8	BASIC test files
	9	Novel (in work)
DEV (4M)	0	Used for overflow, snapshot backups
HDOS (2M)		Bootable drive for HDOS
HDOS2 (2M)		Data drive for HDOS

Table 3. With the large amount of storage space available with a hard disk, you will want to consider how to organize your files. Here's the author's scheme for organizing files on his hard disk. CP/M's USER areas can serve much the same purpose as subdirectories under MS-DOS.

itialization utility like Zenith's FORMAT.COM; but it's specifically designed to format disks on drives plugged into the WD1002 controller.

HDUMP—a special disk sector-dump/edit utility designed to access the hard disk, including sectors normally blocked from operating-system access. Using HDUMP, it is possible to change any byte on any sector of the drive, even if the drive is logically corrupt. It's even possible to rebuild a lost superblock (which defines the partitions on the drive).

HDPARK—a program to place the heads of the hard-disk drive in a "safe" position for transportation of the drive without damage.

LOADD—a program to read and install SigmaSoft LDD modules.

MAKE—a CP/M utility that allows the directory entry of a file to be changed, so that you can effectively move the file to another USER area without actually copying the file itself.

UPC—LDD support for a Centronics-standard parallel printer.

A new way of thinking

Having all this disk space causes my thought processes to boggle at times. Sure, I've had a Z100 with 30 MB running at the store for years now, and would be lost without it. But at home, I've worked with floppy disks for over four years. I always knew which disk had which utilities, which disk had PL/1 on it, and so forth. Once I had the hard disk running, it was inevitable that I would try to load *all* my software onto it.

I ran into several problems. First, not all my software would fit on the hard disk. You can say all you want about the capacity, but more than 125 728K floppy disks just won't fit on a 20-MB drive. Second, even after gleaning and deciding, I found that the number of files made my directory a nightmare. (With a 1,024-file maximum, DIR was a mess!)

Having used high-capacity disks a lot, I had already availed myself of tools that wouldn't really be necessary with small disks. Few single-user systems, for instance, make use of CP/M's ability to set up USER areas. There's little point to setting up an ordinary 5¼" disk with separate directory areas that can't readily access each other.

But I had found USER areas valuable for organizing my 728K storage disks. (If you stop and think about it, after all, hard-disk subdirectories under the Microsoft Disk Operating System can be thought of as nestable USER areas with names instead of numbers.) I already knew the advantages of improved utilities such as the DD.COM and SD.COM directory programs, and the SWEEP file-management program.

Compile times are improved by a factor of five or more over floppy performance.

To get real value from all my new space on disk, it appeared that I had to make more use of USER areas. Using MAKE.COM, I moved things around to different USER areas according to function. (See Table 3.) Even with that organization, I found that file-access time was degraded because of the large number of directory blocks used on the primary CP/M partition.

In addition, I found I had several copies of many programs, one copy for each USER area on which the program was needed. To improve my system, it was obvious I needed one of the public domain enhancements to CP/M's console command processor (CCP).

I finally chose ZCPR2, primarily because it took no additional space from my TPA. Also, it required no BIOS changes. (So I'm lazy; sue me!)

ZCPR2 gave me the features I needed to support my new-found storage:

1. When you change USER areas, the prompt identifies which USER area is current. For example, if you're logged onto drive B:, USER 7, the prompt looks like: B7>
2. ZCPR2 lets you establish a search PATH for program files. If you call a program that does not reside on the current USER area, it will search for the program along that PATH through other USER areas. Keeping frequently used programs in the designated location means that only a single copy of each program is required throughout the hard-disk system.
3. Switching between USER areas is simplified. You can merely type A14: to switch to drive A:, USER 14.
4. If a program is not found anywhere on the specified PATH, a designated .COM file can be run. ZCPR2 will provide to the .COM file the name of the originally called program. I designated LRUN.COM, which will search for the file in a compressed library, then load and execute it.

Being able to automatically use LRUN lets me put all my utilities in a single COMMAND.LBR file on USER 0. It uses a single directory block, and compresses those little utilities into an efficient space (40% less than normal). Moreover, my directory is not cluttered with programs I know are in the COMMAND.LBR.

Performance of the drive system is flawless. The throughput of my work has improved many times over. Although I used my RAM disk frequently before, I now use it little, since the hard disk rivals the RAM disk's performance. Compile times are improved by a factor of five or more over floppy performance. Word-

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Star, Sensible Solution, dBASE, and other disk-intensive software run virtually at RAM speeds. And I don't believe I've ever run out of disk space needed for sort programs or print files!

Best of all, I know I have a peripheral that represents current technology, with reasonably priced replacement parts.

By the way, you can now get SigmaSoft's package with ZCPR3 installed. This will give you a number of enhancements over ZCPR2, and it will save you the hassle of installing it yourself.

Support

SigmaSoft shows strong confidence in their hardware and software. The warranty is straightforward, they listen to their customers, and the documentation gives ample information about what's going on beneath the surface.

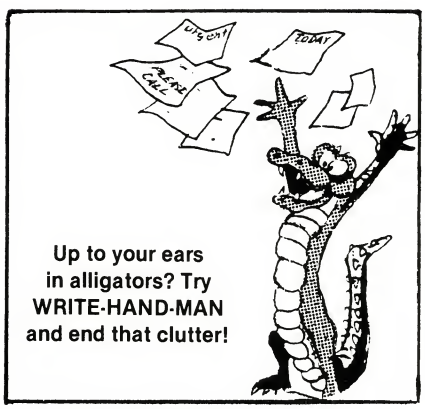
The manual includes a copy of Western Digital's OEM manual for the controller board. A complete parts list (including recommended suppliers) is also included, as are descriptions of SigmaSoft's control blocks (superblocks).

At 10 characters per inch, both the repair-service information and the warranty fit on a single page, and both are simple. The minimum standard repair fee is a ridiculous $15. You can't beat that with a stick!

As I mentioned, you can even get a hard disk ready for internal installation in your '89! SigmaSoft uses the rugged LaPine 3½" drives, and includes a booster power supply to ease the load on the one in your '89.

Qualified programmers may wish to modify some of the SigmaSoft programs. The source code for the SigmaBIOS is available for $95. (Consultation time is invariably required when any changes to a CP/M BIOS are made.) Source code for the utilities is also available. (Modifying the CP/M utilities will require the HDOS assembler.)

New things in the works include some unannounced goodies. And SigmaSoft has always had a very reasonable software upgrade policy.



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It's no fun reviewing if you can't complain!

Beefs? I found *lots* of software bugs. However, you can discount this beef because I was a beta site, and my function as such was to *find* those bugs. And, although there are still a couple of points that I think could be improved, the bugs have been long since fixed.

Regarding points for future improvement, I'd like to see HDPART.COM allow specification of the number of directory blocks for each partition for either operating system. And those of us who need to squeeze out maximum working-memory area would appreciate a SigmaBIOS with hard-disk support *only*, without WD1002 floppy support.

Also, the drive letter assignments using SigmaBIOS are hard-coded and arbitrary; they assume you'll use the WD1002 floppy interface, which may not be the case. (I despise referring to my first Z37 floppy drive as H:.)

It fits

When I reviewed SigmaSoft's IGC, I raved about it as one of the best productivity tools you could buy for your '89. The Hard Disk Subsystem surpasses even IGC. You'll have all your standard software at your fingertips, lots of space for growth and development, high-speed disk access, Z37 soft-sector floppy support, two parallel printer ports, six extra parallel ports (usable for IGC or whatever), great software, and professional support.

It's clearly the best money you can spend for computing performance if you already have an H8 or an '89. The price is in line with expansion systems for the IBM compatibles. Parts and repairs should be no problem, since all components are off-the-shelf. And doing a PL/1 compile at 4 MHz, a Z151 with a hard disk is now outperformed by my H89!

I wish I could use exclamations like "Wow!" or "Shazam!" to describe my feelings about the system. I had it for several months as a beta test site, including several releases of software, a controller update, a buggy interface card, and several kinds of hard-disk drives. Now that the software has settled down to stability in its release form, I've had a chance to use it with confidence for a while.

It's become like a comfortable shoe. Fact is, the only excitement would be if I had to give it up. I can't imagine going around barefoot again.

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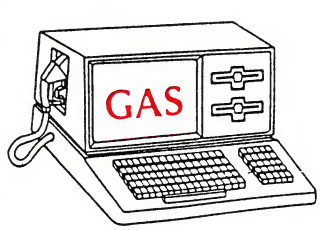

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Circle #131 on Reader Service Card

Supplier Notes

Zenith Mixes Low Price with Ease of Operation

Zenith Data Systems has announced a new computer it sees as competitive with the ease of operation of Apple's Macintosh and with the price of IBM clones. The new eaZy pc is offered in three configurations priced from $999 (with single 3½″ disk drive) to $1,699 (including a 20-MB hard disk).

ZDS estimates it will take five minutes to get the eaZy pc out of the carton, plugged in, and running. Allow another half hour to run the tutorial software.

The eaZy pc's user interface is provided by the new MS-DOS Manager from Microsoft. MS-DOS Manager offers some of the same features as Microsoft Windows, but no graphics interface, multi-tasking, or cross-application data exchange capabilities. MS-DOS Manager's use of character graphics, rather than bit-mapped graphics, allows it to maintain impressive speed running on the eaZy pc's 7.16-MHz 8088 microprocessor.

The 14″ monochrome monitor of the eaZy pc displays text and graphics on a white background. Questioned about the ergonomic validity of this design decision, ZDS President Robert Dilworth replied: "They sure sold an awful lot of Macs."

And ZDS expects to sell an awful lot of eaZy pcs. ZDS Senior Vice President John Frank predicted sales of 20,000 units per month. He claimed the eaZy pc has the potential to be the fastest-selling single model in the personal computer industry this year. Target markets include secretaries, professionals, students, schools, universities, and anyone who wants to run MS-DOS applications at home.

All three models of the eaZy pc come with 512K RAM, a mouse port, and a parallel printer port. The rear of the unit will accept a single option cartridge. Two option cartridges are scheduled for delivery in August. One provides an additional 128K of RAM. The other combines 128K with a serial port and 1200-baud modem. (Zenith Data Systems, 1000 Milwaukee Avenue, Glenview, IL 60025, 800/842-9000, extension 1.)

ZDS Launches New Generation of Color Monitors

Zenith's ZCM-1490 Flat Technology Monitor is here, and CRTs may never look the same. With its perfectly flat, virtually reflection-free faceplate, it improves brightness, contrast, resolution, and color fidelity.

The '1490 is designed around the flat tension mask tube manufactured by Zenith Electronics Corporation. Zenith Data Systems has contracted for ZEC's entire 1987 output of the tube, initially being produced only in 14″ size.

Andrew Czernek, ZDS vice president of product marketing, notes that conventional 14″ CRTs have a face with curvature comparable to that of a sphere with a 28″ radius, but "near flat" tubes reduce the curvature to that of a sphere with a 48″ radius. Lessened curvature reduces the area of the room from which light can be reflected by the screen into the user's eyes. According to Zenith, conventional

monitors reflect light over an angular range 2½ times that of a flat plate.

The flatness of the faceplate on ZEC's new tube makes it economical to apply anti-glare and contrast-enhancing coatings, so ZEC's CRT has a High Efficiency Antireflection coating from Optical Coating Laboratory, Inc. At the May news conference introducing the '1490, ZDS distributed glass discs with a central spot of OCLI-HEA. This coating reduces reflection, so that the disk looks like a glass doughnut. ZEC's tube is said to achieve a 95% reduction in glare.

The ZCM-1490 has been designed to be over 50% brighter than conventional monitors, with a 70% increase in contrast between white and dark areas of the image. Its maximum resolution is 480 lines of 640 pixels each, which leads to one problem.

The '1490 isn't compatible with any color video board ZDS shipped before this summer. Instead, it is compatible with the Video Graphics Array (VGA) output of IBM's new Personal System/2 computers and with their PS/2 Display Adapter for older machines.

ZDS will support the ZCM-1490 with the new Z449 video card for the '150 and '200 series. The combination is compatible with software written to Color Graphics Adapter, Monochrome Display Adapter, Hercules, and Enhanced Graphics Adapter standards.

The Z386 will include the '449, according to John Frank, ZDS senior vice president for marketing. Earlier machines are set to switch over to '449 video during July through September.

ZDS believes users will pay the $150 to $300 extra cost of a Flat Technology Monitor only as part of a whole package including 480 lines of 640 pixels each. The ZCM-1490 has a suggested retail price of $999, while the Z449 lists at $599. Many retailers will probably offer a special deal if the two are bought at the same time.

ZEC is aiming for an annual production rate of around a quarter million CRTs a year. ZDS expects great market success for the ZCM-1490, figuring only two groups will be able to avoid buying one—those who shop strictly on the basis of price, and those who never see a '1490. ZDS plans to cut into the latter number by signing up three national distributors to serve retailers not handling other ZDS products.

The '1490 weighs about 40 pounds and is 12¼″ high x 14¾″ wide x 15½″ deep. Its 15-pin cable connector and 31.5 kHz horizontal scan frequency make it compatible with the IBM Personal System/2. Dot pitch is .31 mm. Brightness is rated at 75 footlamberts. (Convential CRTs are around 45-50 FL.)

For more information, contact ZDS at 1000 Milwaukee Ave., Glenview, IL 60025, 800/842-9000, extension 1.

All the Resolution of EGA—Without the Color

The microcomputer industry's first Enhanced Graphics Adapter (EGA)-compatible *monochrome* monitor was introduced in April by Zenith Data Systems. The ZMM-1470-G 14-inch monitor offers high-resolution displays to those users who "don't necessarily need a color monitor or can't justify the higher cost of color," according to Jeff Maziarek, ZDS marketing manager of video products.

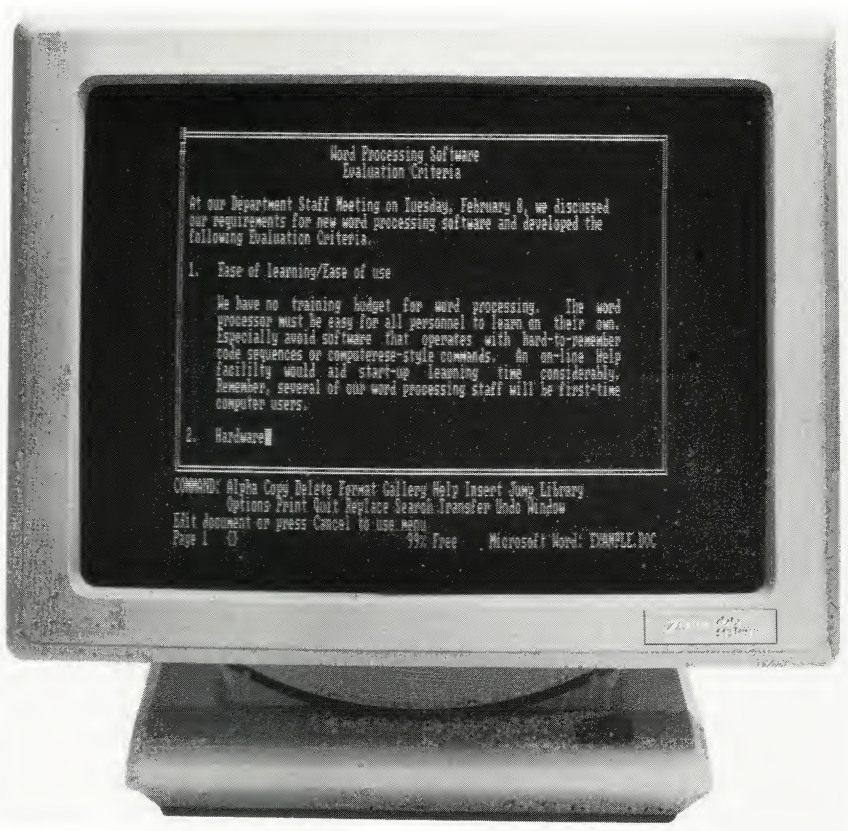
When combined with an EGA card in the EGA-compatible mode, the new monitor emulates a color monitor by displaying a 16-level gray scale. Also, the monitor displays a resolution of 640 by 350 dots, and an 8- by 14-dot character cell in this mode.

The monitor offers several easy-on-the-eyes features. These include a 14-inch display that is about 30% larger than a standard-sized 12-inch monochrome monitor; an etched-glass, reduced-glare screen to minimize eye strain; and a built-in tilt/swivel stand that adjusts to a variety of viewing angles.

The monitor's green phosphor display operates at horizontal scan frequencies of 15.75 kHz and 21.8 kHz, automatically switching between these modes. This versatility enables the monitor to fully support software written for both CGA and EGA video.

Contrast and brightness controls are located on the right side of the monitor, and an LED-equipped power-on switch is located on the tilt/swivel base.

Suggested retail price of the monitor is $299. (In comparison, Zenith's EGA-compatible *color* monitor, the ZVM-1380-C, is priced at $799.)


Word Processing Software
Evaluation Criteria
At our Department Staff Meeting on Tuesday, February 8, we discussed our requirements for new word processing software and developed the following Evaluation Criteria.
1. Ease of learning/Ease of use
We have no training budget for word processing. The word processor must be easy for all personnel to learn on their own. Especially avoid software that operates with hard-to-remember code sequences or computerese-style commands. An on-line Help facility would aid start-up learning time considerably. Remember, several of our word processing staff will be first-time computer users.
2. Hardware
COMMAND: Alpha Copy Delete Format Gallery Help Insert Jump Library
Options Print Quit Replace Search Transfer Undo Window
Edit document or press Cancel to use menu
Page 1
99% free
Microsoft Word: EXAMPLE.DOC

The monitor is FCC Class B approved, and weighs 24 pounds. Its dimensions are 10″W x 11″H x 12.15″D.

For more information, contact Zenith Data Systems, 1000 Milwaukee Avenue, Glenview, IL 60025; 800/842-9000, extension 1.

Use the Reader Service Cards at page 70 to get

FREE INFORMATION

from *Sextant* advertisers!

Classified Ads

Hardware

Two Z90-80s, brand new, still in factory box. $295 each. 213/599-0900 (days).

H/Z100 low-profile, 768K memory, RGB color monitor, dual 5¼" drives, dual 8" drives, spare 5¼" drive. Technical manuals and much software. $2,500. 408/238-9051.

Z100, dual 5¼" drives, 8 MHz, 768K on motherboard, technical reference manuals. Dual double-density double-sided 8" drive system with spare SS/DD drive and hundreds of 8" floppies. Zenith color and monochrome monitors included. Software, with manuals. $2,950 or best offer. H89 with C.D.R. disk controller; best offer. John Jeter, 3107 Indian Wells, Missouri City, TX 77459, or call 713/274-2559 and leave phone number.

Information

PERSONAL COMPUTER OWNERS can earn $1,000 to $5,000 monthly selling simple services performed by their computer. Work at home—in spare time. Get free list of 100 best services to offer. Write: A.I.M.F.V., P.O. Box 60369, San Diego, CA 92106-8369.

Wanted

H/Z89A, 64K computer with Z89-37 controller. Also peripherals, software. Send info to C. Branham, Radio WHJC, McCarr, KY 41544.

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To get in touch with your fellow Heath/Zenith users, place your short notice in *Sextant*'s classified section. The rate is only 75¢ per word, with a minimum of 15 words.

Please omit all *specific* references to software, unless the package is unopened. If unopened, please specify.

Send your typewritten ad and payment to: Sextant, Classified Ad Department, 716 E Street S.E., Washington, DC 20003. Please include your name and phone number for our records.

Deadline is July 23 for the September-October issue and September 24 for the November-December issue.

Coming Up in Sextant

- *Making the most of the '150's scratchpad RAM*
- *Windows for the '100*
- *Speeding Up the H8*
- *ENABLE for the '100 and '150*
- *A review of the H/Z248 computer*
- *Some thoughts on the tenth anniversary of the Heath/Zenith digital computer line*

EVERYTHING YOU NEED . . . $279.00

Now it's easy to program the Heath-Zenith HERO-1* Robot with an Apple* II. HERO* Macros for the S-C Software 6800 Cross Assembler program in Heath's Robot Interpreter Language with easily remembered mnemonics.

For example, the line: 1130 > MVWRIM GRIP, OPEN, 60, FAST instructs the HERO* to open his gripper 60 units at fast speed. Motor position is expressed in base-10.

The HERO* Macros come with 30 pages of documentation.

Transfer to HERO* with ROBI . . . an affordable interface for the robotics experimenter . . . is simple.

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- With ROBI and the Cross Assembler, the programmer uses Apple*'s memory to write the program, and HERO*'s memory to run the program.
- Not "copy protected," archival copies may be made as needed.
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VISA and MasterCard accepted

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The Cross Assembler with HERO* Macros sells for $100.00; the ROBI Interface sells for $199.00. Both as a package—$279.00.

To order, or for more information, call (303) 670-6137.

APPLE* is a trademark of Apple Computer HERO* is a trademark of Heath Electronics

Circle #223 on Reader Service Card

H/Z89-90 PRODUCTS

Replacement Back Panel
Replaces the existing metal back panel. Adds cut-outs for two 5¼" drives, 8" floppies, Winchesters, joy sticks, extra printers, modems, audio output, instrumentation and many, many more.
RBP-200 ..... $35.00

I/O Board Expansion
Adds four additional I/O board slots inside the computer case. Now have seven right-hand and four left side slots. Easy DIP switch port selection. Now run up to four disk controllers or multiple printer boards or ????
EXP-700 ..... $395.00

Transportable Conversion
Kit contains everything to convert an '89-90 into a 32-pound transportable computer. Nine inch amber CRT. Detachable keyboard. Conversion requires only a screwdriver and nutdriver.
TRA-890 ..... $950.00

4MHz Speed Up
Plug-in unit doubles the computer's speed. Eliminates long waits for program execution. Fully supports Heath, C.D.R., and Magnolia. No trace cutting.
DSM-240 ..... $99.97

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Replaces existing monitor. Supports 4 MHz operation. Boots eleven different devices. Expanded commands.
KMR-100 ..... $59.95

Extra Cooling
Extremely quiet 2½" fan provides required extra cooling for hot machines. Easily mounts between the two card cages. Plugs inside with the existing fan connector.
SCF-200 ..... $59.95

DSM-240, KMR-100, RBP-200, SCF-200 include $3.50 S&H/unit. EXP-700 include $6.00 S&H/unit. CA residents add 6½% sales tax. All prices subject to change without notice.

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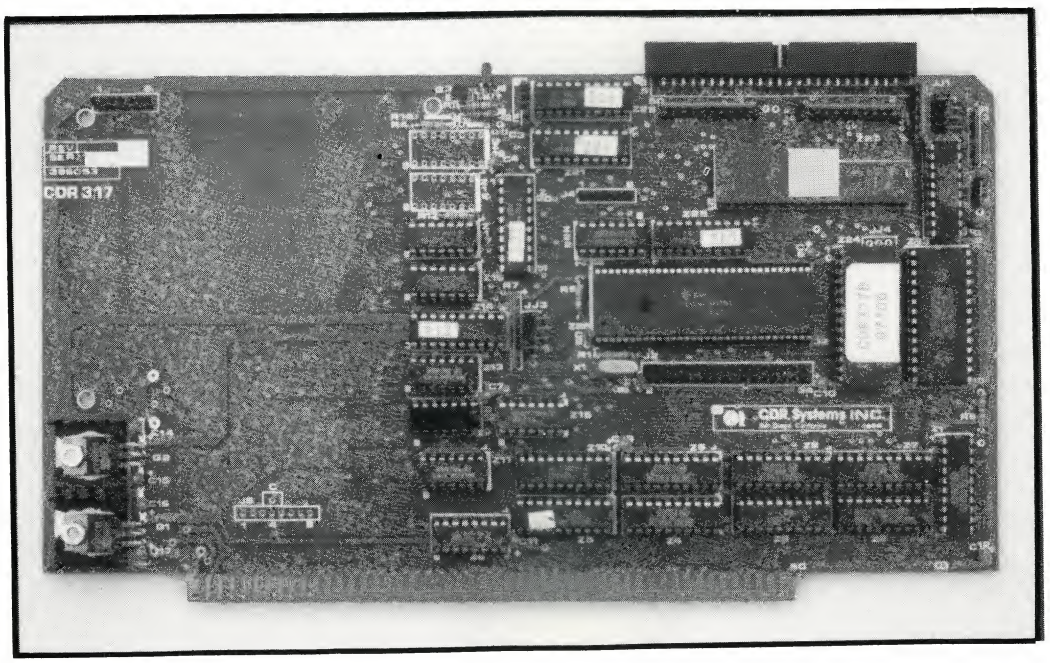
Circle #194 on Reader Service Card

A HARD DISK CONTROLLER PACKAGE THAT GOES BEYOND JUST ANOTHER CONTROLLER

THE ULTIMATE MASS STORAGE INTERFACE FOR THE ZENITH Z100 COMPUTER . . .



* SCSI (Small Computer Systems Interface) based mass storage controller for Winchester Drives and more.
* WORKS with any version of memory upgrade.
* WORKS at any Z100 speed (5 through 8 Mhz).
* WORKS with all versions of MSDOS, ZDOS, CP/M85, CPM86, and MP/M that handle the Zenith Z217 Winchester controller.
* WORKS with both the GEMINI and UCI emulation boards, plus all versions of ZPC 2 boards.

The CDR317 Intelligent Interface Board (CDR317-IIB) is an SCSI Host Adaptor that looks exactly like the Zenith Z217 Hard Disk controller to the H/Z110 or H/Z120 computer. It communicates directly to SCSI built-in drives like the SEAGATE ST225N drive for the cleanest and most cost effective hard drive add-on in the Z100 market. Up to 4 SCSI built-in drives can be used off of the controller on the 50 pin SCSI cable with the standard Zenith software. The CDR317-IIB can physically handle 15 SCSI devices.

The CDR317-IIB can also interface with the OMTI 3100 or XEBEC 1410A controllers to use standard ST506/412 compatible drives and SYQUEST cartridge removable drives. Each controller can use two drives. The CDR317-IIB can handle two OMTI or XEBEC controllers through the standard Zenith software, which has a maximum of 4 drives and a limitation of 64 megabytes for each drive. For the two board set, ask for the CDR317 PACKAGE. It contains the CDR317-IIB, ST506/412 controller, cables, and bracket for internal mounting.

With the CDR317, the Z100 can use current mass storage devices as well as the peripherals to come. We are committed to adding SCSI based peripherals: CD ROMS, the new 5.25" Bernoulli Box, the new Kodak Cartridge drive, small scale SCSI based (fast) networking, etc... to the CDR317 capabilities. Thus providing the most powerful mass storage interface available for the Z100 computer.

Ask about our other Z100, and H/Z89-90 products and about the Kodak SCSI cartridge drive package for the IBM-PC compatibles.

Call for current pricing, information, and for the name of a certified dealer near you.

Controlled Data Recording Systems Inc.
7210 Clairemont Mesa Blvd.
San Diego, Ca. 92111 Phone (619) 560-1272

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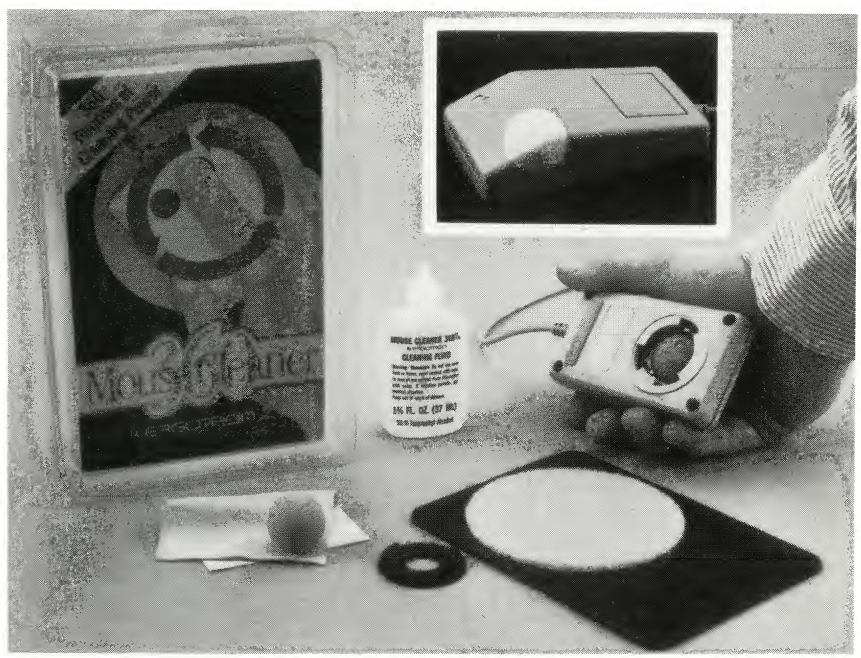
Circle #108 on Reader Service Card

Scuttlebutt

Evolution (if you believe in it, of course), is such a slow process that it usually takes centuries before change becomes evident. However, only a quick glance at Zenith Electronics Corporation's first-quarter 1987 earnings provides evidence of the company's **transformation from a television manufacturer to a computer maker**. While revenues from the TV, VCR, et al., department increased two percent (to $275 million) from last year's first-quarter total of $270 million, sales of computer products more than doubled, going from $131 million to $272 million.

Zenith readily credits this increase as the most significant factor in its 36% increase in revenues (to $547 million) for the beginning of 1987. Computer systems and components reached a 49.7% share of Zenith Electronics Corporation sales, up from 32.7% of 1986's $401 million first-quarter sales.



Ergotron's Mouse Cleaner 360° Kit includes a cleaning ball.

Zenith's $272 million in first-quarter sales of computer systems and components was well **ahead of Compaq's revenues** for the same period: $210 million. Generally considered the leader in the IBM-compatible personal computer market, Compaq enjoyed a healthy growth rate of 47% over 1986's first quarter. But Zenith's 108% growth let it take the lead in revenue for the first time.

Compaq is probably still ahead in retail sales, as Zenith's figures include both government contracts for computer systems and sales of components (such as power supplies) to other computer makers.

What goes up doesn't necessarily come down, if it's the price of computers. But, in the case of the new Z159, the price did decline since publication of our May-June issue (see p. 90). **Prices dropped** from $250 to $300. Model 1 is now $1,499; Model 2 is $1,599; Model 3, $2,199; Model 12, $1,899, and Model 13, $2,499. The amount of RAM also changed—happily, though, in the other direction—from 256K to 512K.

Zenith has decided to bring Zest to grades K-12 throughout the nation. No, company honchos haven't decided to market the soap of that name; the "ZEST For Learning" (Zenith Education Sales and Training) program provides from-the-manufacturer pricing and local dealer service to K-12 school districts supplying Zenith desktop computers to classrooms and offices. Under this arrangement, Zenith and its local computer dealers are required to support each school account. ZDS vice-president of sales Art Lambert explains that the arrangement is designed "exclusively for the limited budgets of K-12 schools, yet recognizes their intensive support and training requirements." But there's more to it than that, of course—Zenith expects the **kindergarten-to-high-school** market to be one of the fastest growing segments of the personal computer industry over the next few years. ZEST features all current ZDS products, and the company has also designed two K-12 workstations, at savings above the standard ZEST discounts. For more on ZEST, call 800/842-9000, ext. 2.

Is your mouse dirty? Is cleaning it with cotton swabs and solution too much of a hassle? Well, Minneapolis-based Ergotron, Inc., believes its newly developed Mouse Cleaner 360°™ Kit—which comes with a Velcro-covered scrubber ball, scrubber board, lint-free chamois cloth, and a bottle of cleaning solution—is the easiest and quickest way to **wash a dirty mouse**. To use, you apply a few drops of the solution to the scrubber ball, and place it in the mouse, which you then rotate in a circular motion over the scrubber board, activating hundreds of tiny scrubbing bristles (sounds like a detergent commercial!) that whisk away all unwanted residue from your mouse's tracking rollers. The mouse cavity and positioning ball are then cleaned with the chamois cloth and, after reassembly, your mouse is squeaky clean! Mouse Cleaner 360° is compatible with all major mice that use a 1″ diameter positioning ball. A version for mice with the ⅞″ ball will be released soon. For more information, contact: Steven J. Krause, Ergotron, Inc., 1621 East 79th St., Minneapolis, MN 55420, 612/854-9116, 800/328-9839.

If you still think cleaning your mouse is drudgery, perhaps you should take a look at Torrington Company's Manager Mouse. After all, this mouse, which uses wheels and a patented suspension system, came in first in a recent **dirty mouse test** with two standard track-ball-designed mice: Logitech's C7 and Microsoft's serial model. The three mice raced on a specially designed test fixture made out of a standard formica tabletop littered with "typical desktop debris," such as pencil shavings, eraser remains, and cigarette ashes. Racing at the breathtaking speed of 1.5 miles per hour, **the mice took pit stops** every five miles to be examined and, if needed,

cleaned. The unroadworthy C7 required cleaning at each stop, while the Microsoft unit needed attention at every stop after the first 40 miles of the 100-mile race. The champion Manager Mouse, however, motored through all 100 miles maintenance free. To order, contact the Torrington Company, 59 Field St., Torrington, CT 06790, 203/482-9511.

Do your computers refuse to talk to each other? Such **lack of communication** is no longer a problem, thanks to newly formed Data Conversion Services, which has developed a system for converting a client's data among 1,000 computer formats. Headquartered in Novato, California, Data Conversion Services specializes in fast turn-around, offering nationwide same-day pickup combined with a 24-hour production schedule. It services all 50 states and Canada. Free over-the-phone technical assistance is available nationwide by calling 800/327-0330. According to company owner Jonathan Chilvers, the most popular conversions are from old-fangled dedicated word processors to today's general-purpose computers. Also popular is the downloading of data from mainframe magnetic tapes to floppy disks, and the exchanging of data between incompatible computers. Additionally, Data Conversion Services has developed proprietary programs to import data directly into widely used application programs such as Lotus 1-2-3, dBASE III, and WordPerfect.

Just When You Thought They'd Thought of Everything Dept.: For forgetful souls who have occasionally **left their credit cards behind** at stores or restaurants, or, even worse, have actually lost their essential pieces of plastic, the California firm Creative Design offers a preventive device. The company's "SecuraCard" Wallet will sound a beeping alarm if credit cards are not returned to it. The SecuraCard Wallet, available in either brown or black, comes with a three-year battery, and a guarantee of satisfaction. It costs $22.50, postpaid. Write: Creative Design, 21115 Devonshire St., Suite 131, Chatsworth, CA 91311. Just don't forget to put your cards in the wallet!

Attention "Heath/Zenith Compatible People!" The **sixth annual CHUGCON** will take place October 24-25 (Saturday and Sunday) at the Sheraton Hotel in Tysons Corner, Virginia. The international conference, sponsored by the Capital Heath Users' Group, will feature tutorials and demonstrations for all levels of expertise. It also will include a larger-than-ever-before display area, and promises to be the biggest East Coast gathering of Zenith supporters. Despite being "bigger and better," the event still requires only a nominal registration fee. For more information, contact CHUGCON, P.O. Box 16406, Arlington, VA 22215-1406; or CHUG FIDO BBS, 703/797-7236 (modem), or CHUGCON Voice, 703/339-7330.

Z248 users will be able to transform their 80286-based machines into 80386 systems—maybe. Whether or not Zenith will mass produce the upgrade kit—which made its debut at a recent Navy-sponsored microcomputer conference—depends on whether the product falls within the outlines of Zenith's three-year military contract. So, while you wait (and **don't hold your breath**), here are some details about the kit: it will include a backplane board that has six 32-bit slots, four expansion slots (two for boards compatible with the IBM-PC, two for AT-compatible boards), a new CPU card with 386 processor, a 1-megabyte memory card, and an I/O card with serial and parallel ports. The boards will be identical to Z386 boards, but would allow users to keep their old drives, cabinets, and keyboards, and also avoid the $6,499 starting price for a '386.

ZRAM-205: RAM Multiplier

The ZRAM-205 package is used to modify a Z-205 memory card so that thirty-six 256K RAM chips (not included) can be installed in place of the existing 64K RAM chips giving 1024K of bank-switched memory in the form of four banks of 256K each. Bank 0 (256K) is selected automatically on power-up and must be used as part of system memory. Included MS-DOS software (with source code) makes the remaining three banks into a 768K RAM disk. The modified Z-205 still uses only one S-100 bus slot and will operate at 8MHz if 150 nanosecond RAM chips are used.

The ZRAM-205 package includes a small piggy-back circuit board, a packet of wire and sleeving, a diskette, and a user's guide. Installation takes about 2 hours and requires some soldering to connect the RAM chip socket pin-1's together and to the small circuit board. Our ZP173 PAL is required if used with new motherboard 768K Z-100™.

$49 Each (+ $8 for ZP173 PAL)

ZMF100a: 768K On Old Motherboard

The ZMF100a™ modification package lets you plug industry standard 256K RAM chips into your "old" motherboard Z-100™ computer. Up to 768K (27 RAM chips) without using an S-100 bus card slot! Maintains fully compatible memory maps so that all software will run. Usable only on part number 85-2653-1 motherboard (assembly part number 181-4917 or less)!

Installation of the ZMF100a™ package is a simple, plug-in job requiring ***no soldering*** or trace cutting and only partial disassembly of the computer. The memory chip pin-ones are connected together by a plug-in bus bar. There are no permanent changes to the motherboard.

The ZMF100a™ is a professional quality circuit board supplied with complete instructions and all required materials, except memory chips. It is compatible with the popular PC emulators and with 8MHZ speed modules.

$65 Each

FBE SmartWatch: Calendar/Clock

The Dallas Semiconductor DS1216E SmartWatch is a chip-sized module that plugs-in under the computer's monitor ROM. It contains a full-functioned calendar/clock and works in the Z-100 series (spacer kit required), Z-138/148, Z-150/160 series, and Z-158 computers. Easy installation. Our package includes the SmartWatch, MS-DOS date/time setting software on diskette (with source code) and documentation.

$44.95 Each (+ $2.00 for Z-100 Spacer Kit)

FBE

FBE Research Company, Inc.
P.O. Box 68234, Seattle, WA 98168
(206) 246-9815

Order Direct from FBE or
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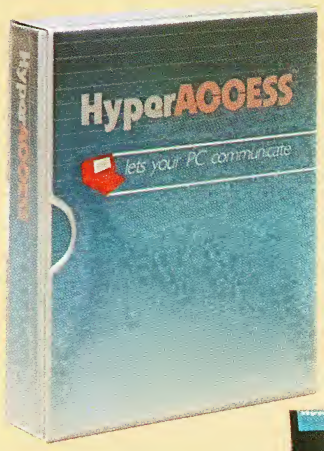

HyperACCESS™

Top Rated Communications Software

Editor's Choice
PC MAGAZINE
October 28, 1986

"An excellent program with many advanced features, including a comprehensive language, unattended host and file transfer capabilities."

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Software Digest RATINGS NEWSLETTER
September, 1986

"The consistent combination of power/usability ratings put HyperACCESS at the top..."

Rated ●●●● by
InfoWorld
July 14, 1986

"It's a snap to start using the program immediately... you can be communicating in a matter of minutes."

Whether you're just beginning to use your PC for communications or you've been frustrated by limitations of another program, HyperACCESS is the answer. Simple for novices. Exhilarating for experts. Ideal for businesses.

There's no initial hurdle. HyperACCESS **adapts itself** to your computer and modem (it dials, redials, and answers more than 40 models). You can use it just by looking at your screen. The manual is crystal clear. A detailed training program is included.

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